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Original Contributions.

PERIDENTAL ABSCESS.

BY EUGENE S. TALBOT, M.S., D.D.S., M.D., LL.D.

Peridental abscess was first brought to the attention of the profession, if I am not mistaken, by Dr. Edwin T. Darby of Philadelphia in a paper read before the Pennsylvania State Dental Society in 1880.

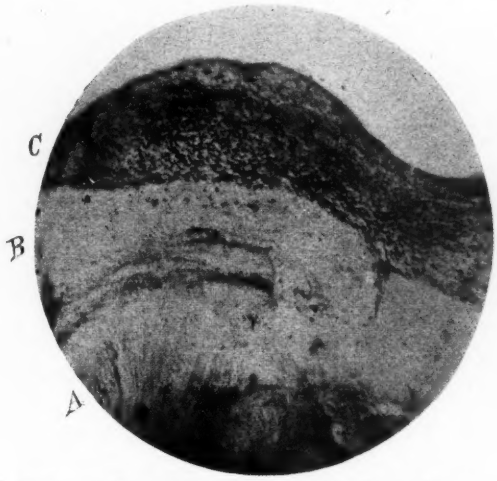


FIG. 1—Inflammation of the peridental membrane.

I was the first to demonstrate this abscess in a paper published in the *International,* April, 1896. Since then I have in connection with my research work demonstrated it many times in nearly all cases in which the gums and alveolar process are involved. In this paper peridental abscess will be demonstrated as a result of some of the more marked diseases.

Pathology of the structure which surrounds the teeth cannot be understood unless the normal condition be known. The alveolar process is composed of loose or cancellated bone structure and is solely for the purpose of holding the teeth in place. When the teeth are absent the alveolar process is not present. In the lower vertebrates there is a continuous succession of teeth (polyphyodontia). When one tooth has performed its function it disappears to give way to another. This continues throughout life. In the development of man change occurs. The two-set or dyphyodontia condition has developed. The alveolar process and teeth have, however, retained remnants of the physiologic processes of removing useless structures. Should man live long enough he would normally lose his second set of teeth by osteomalacia or senile absorption. This is one factor of the transitory nature of the alveolar process.

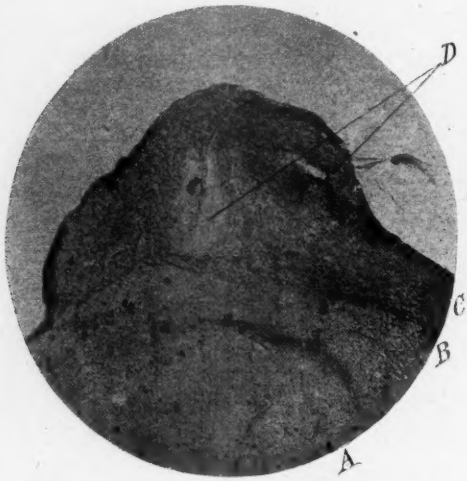


FIG. 2—Thickening of the peridental membrane with abscess.

Another factor has been brought about by the evolution of the jaws. Human jaws once measured 2.75 inches laterally. There was excessive prognathism. Much work was performed by the jaws and teeth. These have been growing smaller and smaller, until to-day the former measure two inches in diameter. Prognathism has approximated orthognathism. That etiquette which encourages

mastication with the lips closed has had much to do with the disuse of the jaws. When the teeth have not grown smaller in proportion, irregularities result. Having these two great factors with which to contend, the alveolar process is necessarily the most transitory structure in the body. Hence it is likewise the most morbidly susceptible.

Other than for etiologic purposes, it is erroneous to speak of "Many forms of gingivitis," as to state, "the disease presents two,

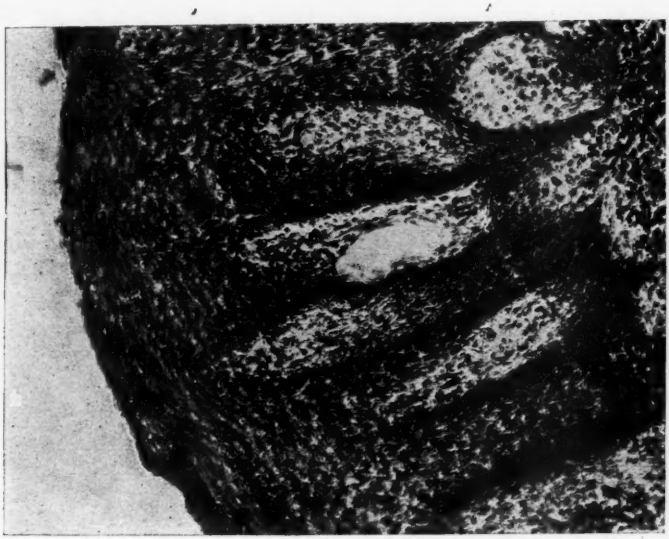


FIG. 3—Inflammation of the gum.

three, four or five different forms, etc." No matter whether the irritation be local or constitutional, the result and the pathology are the same.

Inflammation in the alveolar process and soft tissues takes the same course it would in other bones and soft tissues. It will either terminate in resolution, and the structures return to nearly normal, or it will result in absorption, ulceration and abscess. Inflammation either builds up the structure, as in hypertrophy, so beautifully illustrated by Dr. G. Lenox Curtis in "Syphilitic Locolosis Alveolaris"

(*Jour. Am. Med. Assn.*, June, 1900; *Digest*, 1900, p. 664), or it destroys the bone by absorption.

Irritation when local first produces gingivitis which, becoming chronic, extends to the alveolar process and assumes an interstitial character. When irritation is constitutional, due to autointoxication or drug-poisoning, the alveolar process and deeper tissues become involved, then assuming an interstitial character, later affecting the gums, producing gingivitis.

How susceptible the alveolar process is to interstitial gingivitis is well illustrated in everyday cases. Extract two teeth upon one jaw, and inflammation about the tooth or teeth having no occlusion sets in, bone cells are deposited, and the alveolar process elongates, carrying the tooth or teeth upwards or downwards until occlusion is restored. Later, when autointoxication takes place, violent inflammation sets in, with marked interstitial gingivitis, absorption and loosening of the teeth.

A seamstress bites her thread, and interstitial gingivitis results, with absorption of the bone and loosening of the teeth. Persons of very low vitality, poorly nourished people suffering with prolonged

FIG. 4—Round-cell infiltration from arteries.

sickness, and pregnant women have general interstitial gingivitis. Persons overworked or suffering with neurasthenia are prone to it.

In syphilis interstitial inflammation is set up not only in the alveolar process, but in all the bones of the body also, causing hypertrophy as well as absorption and death of bone. Heat and allied irritation will produce interstitial gingivitis and bone absorption.

Some more severe forms of interstitial gingivitis deserve attention from the irritation point of view. I have for years moved the teeth

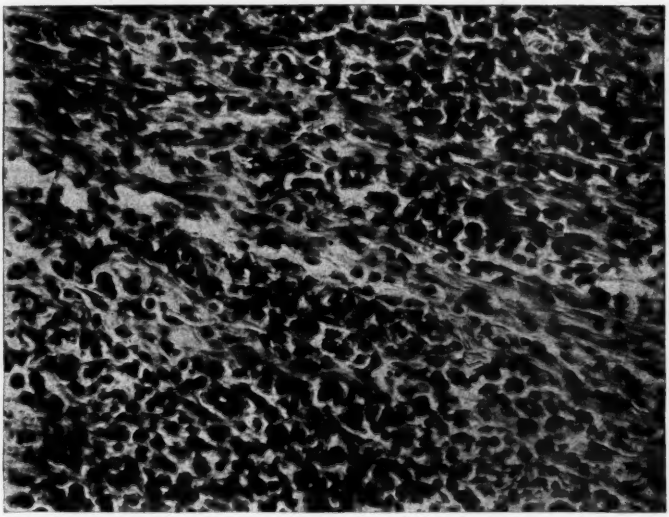


FIG. 5—Inflammation and fibrous tissue.

of dogs with regulating appliances, using a screw with 60 threads to the inch. In some the screw was turned one-fourth around, in others one-half, and in still others one full turn once a day. Some of the dogs were killed in three days, others in a week, and still others in two weeks. By this method the simplest and most severe forms of pressure were applied, the length of time being brief as well as extended. These tissues were decalcified, cut, stained and mounted for the microscope. In every case inflammation was produced. This disproves the theory so long held, that bone absorption

in regulating teeth is purely a physiologic process. Teeth were also extracted from dogs, and after a week they were killed. The bone was decalcified, cut, stained and mounted for the microscope. The absorption was inflammatory in character. The jaws of dogs and monkeys who were erupting the permanent teeth were treated in like manner. Absorption of the alveolar process to allow the teeth to pass into position was of inflammatory type. Simple irritation as well as severe pressure hence produces the same pathologic process, inflammation or interstitial gingivitis.

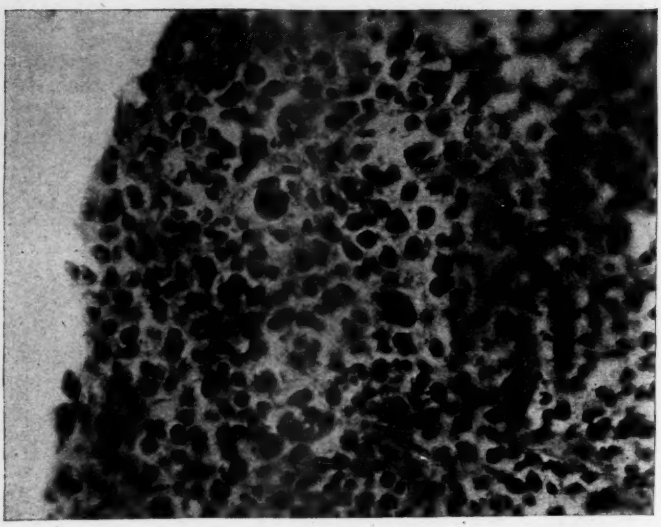


Fig. 6—Inflammation without fibrous tissue.

The blood vessels which supply the gums, peridental membrane and alveolar process are, as I have elsewhere demonstrated (*International,* April, 1896), closely connected. Those in the peridental membrane form a plexus along the wall of the alveolar process, while only a small number are near the roots of the teeth. So closely connected are these that the vessels in one cannot become involved without involving those of the other tissues. Hence, gingivitis occurs which in reality becomes interstitial, or interstitial inflammation appears which in reality becomes gingivitis. No matter what the cause

may be, or whether the inital lesion be in the gum or interstitial structure, absorption of the alveolar process results.

Three forms of absorption of the alveolar process are always present—halisteresis, Volkmann's perforating canal absorption, and lacunar or osteoclast absorption. These are named in the order of the rapidity with which they destroy the alveolar process. Inflammation and bone absorption may and do go on for years without pus infection. Pus germs may be carried to any part of the inflamed process, as I have elsewhere shown. An abscess may form at the

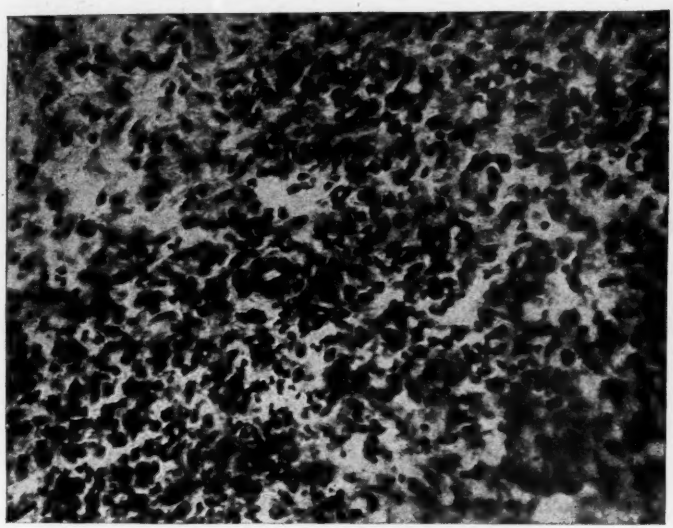


FIG. 7—Acute inflammation.

border of the alveolar process, or it may form upon the periosteum at the outer border. Owing to the tortuous position of the blood vessels in the alveolar process, the pus germs usually collect at the border, stasis of blood generally being greatest at that point. I first demonstrated in 1896 absorption of the alveolar process, thickening and breaking down of tissue into an abscess. This tooth was taken from the mouth of a man fifty-four years old. He was suffering from autointoxication, due to neurasthenia from overwork, with a slight attack of Bright's disease, Figs. 1 and 2. These are of low

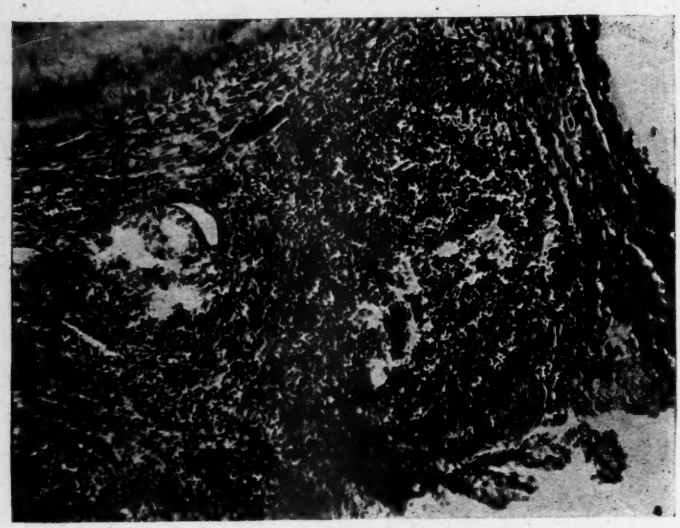


FIG. 8—Formation of two abscesses.

magnifying power. Fig. 1 shows the first stages, round-cell infiltration and thickening of the peridental membrane, with correspond-

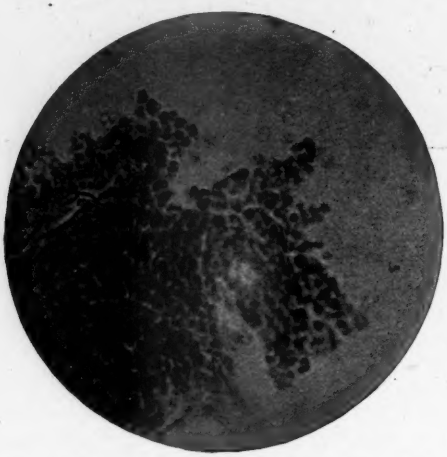


FIG. 9—Inflammation due to mercurial poisoning.

ing absorption of the alveolar process which does not show here. Fig. 2 illustrates thickening of the peridental membrane, which in reality is nothing more than a large area of fibrous tissue, the result of absorption of the lime salts of the bone, leaving the mesh of fibres, which occasionally come away with the extracted tooth. The pathologic state is here farther advanced than in Fig. 1. In the center of this thickened mass is seen a white area at D, a breaking down of tissue. To the right and near the edge the tissue has broken down

FIG. 10—Abscess due to mercurial poisoning.

and an abscess has formed. In 1897, in an article read before the Section on Stomatology of the American Medical Association, I demonstrated the pathology of the disease from simple inflammation to the breaking down of tissue. The pathology here pictured in this series is illustrative of that in all peridental abscesses.

The following are illustrations magnified 480 diameters. Fig. 3 shows gum tissue with round-cell infiltration due to irritation from a gold crown. Tooth loosened and was removed. Fig. 4 is a cross-

section of peridental membrane of the left inferior central incisor of a lady twenty-nine years old, who had been under my care for fourteen years. Owing to her occupation, that of dressmaking, she had no exercise. She was in the habit of biting her thread with this tooth. She drank no water. The result was autointoxication. Two cross-sections of blood vessels are seen considerably thickened (endarteritis obliterans, with round-cell infiltration about them.

The following four illustrations show different stages of inflammation and degeneration of the peridental membrane of the right superior first molar in a forty-year-old lady, marked neurasthenic,

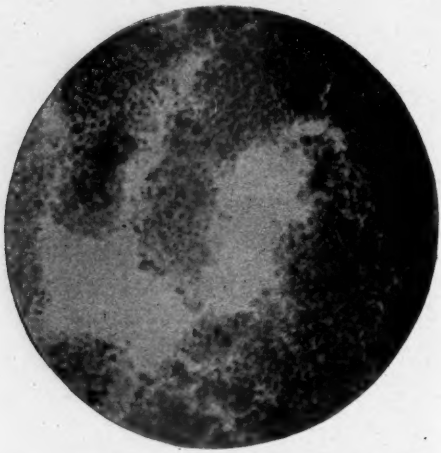


FIG. 11—Inflammation due to lead poisoning.

who has had interstitial gingivitis with pyorrhea for the last twenty years, and is now losing teeth very rapidly. Fig. 5. Cross-section of palatal root near apex, showing connective tissue with active inflammation. Fig. 6. Cross-section farther down, showing further stage of inflammation of the peridental membrane, with all sizes and kinds of connective-tissue cells and round-cell infiltration. Fig. 7. Cross-section still farther down on the same root, showing further stage of inflammation. Fig. 8. Cross-section lower down and of low magnifying power, shows degeneration and liquefaction of tissue. Two areas with violent round-cell inflammation about to break down into abscesses.

From paper No. 4, Pyorrhea Alveolaris in Mercurial and Lead Poisoning, *Cosmos*, 1897, I quote the following: Fig. 9 illustrates active inflammation of the peridental membrane in a forty-eight-year-old merchant who was a dyspeptic, debilitated and asthmatic. He had been under calomel and tonics for less than two weeks. When he came under observation the mucous membrane and gums were much inflamed, there was marked sialorrhea, the teeth were loose, the gums were swollen, pus oozed from the gums, and the breath had a decided metallic odor. At my suggestion his medical attendant stopped the calomel. He was then ordered six pints of spring water daily. The gums were on alternate days saturated with iodin. In a few days the soreness and swelling were so reduced that the deposits could be removed. In a short time the patient was discharged cured, other than as to the right inferior second molar, which was so loose as to require removal. This tooth was placed immediately in fifty per cent alcohol for twenty-four hours and then removed to absolute alcohol for twenty-four hours more. The membranes had

FIG. 12—Four abscesses due to lead poisoning.

receded about two-thirds the length of the root. Sections for microscopic purposes were made from the lower third of the root. Of these sections Fig. 9 shows a small fragment or inflamed peridental membrane. Fig. 10 exhibits violent round-cell inflammation, degeneration and liquefaction of tissue or abscesses.

A thirty-five-year-old diabetic painter came under observation for lead poisoning. His gums were swollen, there was decided sialorrhea, the teeth were loose, and pus flowed from the gums. He was placed on ozonate spring water and the gums were saturated with

FIG. 13—Four abscesses in a 64-year-old diabetic man.

iodin on alternate days. Three loose teeth were removed and placed in alcohol. Sections from the upper third of the left superior second bicuspid, on microscopic examination, gave results similar to those already described in mercurial poisoning. Fig. 11 shows round cells of inflammation. Fig. 12 illustrates very marked degeneration of the peridental membrane. In the right-hand corner are seen root of the tooth, dentin and cementum. The whole surface of the peridental membrane is in an advanced stage of inflammation. Just at the border of the root is evident an area of membrane softening. Just be-

yond, but joining, is noticeable breaking down of tissue. In the center are seen two areas of softened tissue more advanced in degeneration.

Two cases that have never been published are added to my collection of slides showing peridental abscess. These illustrate the wide range of diseases in which it may occur. Fig. 13 (X50) illustrates the four stages of abscess in the peridental membrane of a sixty-eight-year-old man, a contractor. He was a diabetic, a neurasthenic,

FIG. 14—Scurvy. Round-cell infiltration from three small arteries.

with autointoxication which finally culminated in kidney lesions. The illustration shows active inflammation at different points, the two lower areas breaking down and liquefaction of tissue. The upper space shows an abscess with bacteria within, while without is seen round-cell inflammation.

The following scorbutic case was referred to me by Dr. George W. Johnson: A twenty-five-year old American was admitted to Cook County Hospital for the Insane December 2, 1892, suffering

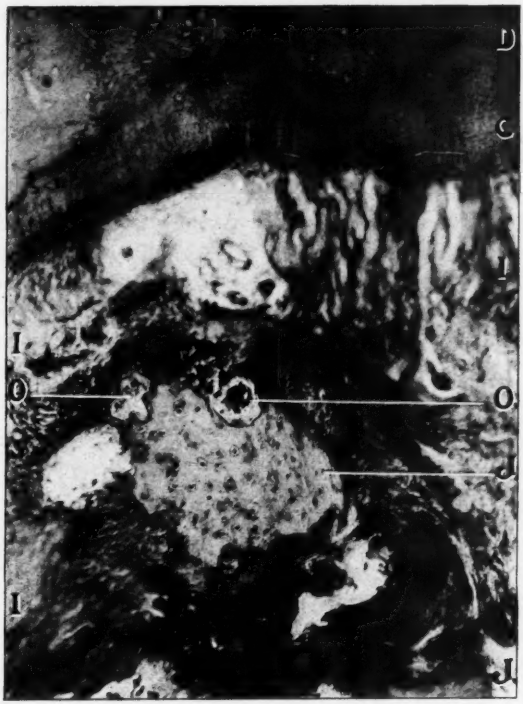
with melancholia, attended by delusions of persecution, and suicidal tendencies marked by refusal of food. June 1, 1896, he again began to refuse food, but took liquid diet on persuasion. June 29 the patient was transferred to the hospital because of his emaciation, and scorbutic symptoms were discovered. July 18 the constitutional and local symptoms of scurvy were well marked. The teeth were covered with sordes and loosened. Under antiscorbutic treatment these symptoms had fully disappeared by August 13.

Fig. 15—Scurvy. Formation of abscess.

Through the kindness of Dr. Johnson I was allowed to see this patient. I found none of the teeth very loose, showing the disease was superficial. I removed two teeth that were decayed and the most loose. These were prepared for the microscope in the usual way. Fig. 14 shows the gums and peridental membrane in an active state of inflammation. Small blood vessels are observed in different localities, with round-cell infiltration extending into the tissue. Fig. 15, the root of the right superior second bicuspid with peridental

membrane attached, shows active inflammation about an artery which has thickened, and an area of tissue degeneration, forming an abscess.

I will now call attention to another form of abscess of common occurrence, but as yet undescribed. In interstitial gingivitis absorption of bone takes place by halisteresis, Volkmann's perforating canal absorption, or lacunar or osteoclast absorption. In nearly every case, as I have elsewhere shown, this absorption so takes place that islands of bone become dislodged. Fig. 16. These cause irritation, pus germs infect the part, and abscesses result about the roots



× 50, ½-inch objective, No. oC.

FIG. 16—Cross section of tooth, alveolar process and peridental membrane, showing lacunar absorption. Man. C, cementum; D, dentine; I, peridental membrane; J, alveolar process; O, lacunar absorption.

of the teeth. The pus burrows its way to the surface and spiculæ of bone are discharged. The abscess may heal of its own accord, but treatment is generally necessary.

That the calcic deposit upon the roots of teeth and in abscesses is due to absorption of the alveolar process there can be no doubt. In 1898 Dr. George T. Carpenter and I independently made extensive experiments upon pus in abscesses and pockets, each with the following results. Summing up, Dr. Carpenter pertinently asks: "But can tissue be absorbed and still remain as debris in the pocket? Such is the condition found in pyorrhea pockets, which can be easily proved by taking the contents of a pocket, dissolve it in hydrochloric acid, add three times its bulk of water, filter, boil, and when cold add a solution of ammonia, which will precipitate the phosphate of calcium. The same result is attained by rinsing a freshly-extracted, roughened, pyorrhea root in cold water, then with a stiff brush and water brush the roughened parts and put the resulting product into a test-tube, add hydrochloric acid and water if necessary, filter, boil, and to this add a solution of ammonia, and the lime salts are precipitated."

I collected the contents of peridental abscesses in a sterilized teaspoon, and Dr. Wesener, chemist of the Columbus Medical Laboratary, found that there was an average of eight times more lime salts in the pus cavities than in normal blood. Since stasis of blood has taken place in a large area about the abscesses and pus pockets, deposit from the vessels seems out of the question.

A PLEA FOR UNIFORMITY IN THE PREPARATION OF ROOTS AND THE CONSTRUCTION OF BRIDGEWORK.

BY C. L. HUNGERFORD, D.D.S., KANSAS CITY, MO. READ BEFORE THE NATIONAL DENTAL ASSOCIATION, AT NIAGARA FALLS, JULY 28-31, 1902.

The most urgent need of the dental profession to-day is a positively recognized uniformity of practice as regards the more general operations, and this irrespective of personal limitations. There is no use denying that the major part of dental work consists in the application of mechanical principles that do not admit of variation, though in their exploitation the personal equation will of course determine the *quality* but not the character of the work.

I believe that the great diversity of opinion among prominent practitioners concerning many methods of practice comes chiefly from viewing the many-sided crystal of professional life from only one or two aspects, the result being a distorted vision of all facets except those directly in front of them.

A life that has been almost exclusively devoted to filling teeth does not readily lend itself to the construction of plates or the correction of deformities. No sane man in dentistry to-day would question the truthfulness of the assertion that a pulpless tooth, antiseptically filled to the apex, will remain throughout life a firm and serviceable organ; and if this desideratum is not universally obtained, it indicates that the operator lacks a special talent for this kind of work, or else is ignorant of the approved methods of accomplishing it.

It is only a very foolish man who denies to another that which he himself is unable to perform. Dentistry has reached out into the collateral sciences so far during the last decade that a man thoroughly equipped in all the departments of this profession is almost an impossibility, and if found we should be inclined to place him upon a pedestal as an abnormality to be exhibited to the admiring multitude.

In the various methods employed in the construction of bridgework there seems to be the greatest difference of opinion among prominent practitioners concerning the fundamental principles to be followed. To instance a few examples: We hear that a sound tooth should never be cut off to make an abutment for a bridge; that one of the ends of a bridge may consist of a spur anchored into a filling, a slot, or a metal-lined groove; some use gold, some platinum, others prefer alloys, where the mathematical accuracy of the compounds seem to constitute their only virtues. Dr. A. destroys all pulps when bridges are to be attached; Dr. B. never destroys any, but prefers to allow the pulps to turn to stone of themselves; Dr. C. agrees to all that has been said, but allows only the tips of the dummies to rest against the gum, so that the tissues may not become irritated by confined secretions—he always makes a smooth, self-cleansing space next to the tongue, which after the first meal is filled flush with debris and so never needs any cleansing! Crowns are made open-faced, closed-faced, enamel-faced—each has its votaries who, devoid of design, worship without reason the idols of their fathers.

The evolution of bridgework has been the greatest achievement

of modern dentistry, but it could never have come to its present perfection without the aid of the inventors of broaches, whose instruments alone have rendered it possible to construct foundations for serviceable bridges. Bridgework has been very largely decried in many sections of the country, especially in the eastern states, and this is not to be wondered at, when we consider that a serviceable and protective bridge could never be adjusted under the conditions in which it is so frequently attempted. In the old days—not so very long ago either—when the modus operandi of infection was unknown, and instruments for removal of the pulps of teeth were unobtainable, it naturally resulted that this operation was faulty and was resorted to only as a last expedient. Such is not the case to-day. Many dentists who decry this work in their speeches plainly show in their offices that they are unfamiliar with modern instruments for the purpose, or devoid of skill to use them.

When bridges are placed upon teeth with live pulps, these teeth almost without exception develop pulp-stones, with the sequelæ of irritation, neuralgia and abscess, while the torture to the patient in grinding down and paralleling such teeth is inexcusable. When, in addition to all this, bridges are constructed in the laboratory from models made from impressions, what possible chance is there of adequate adaptation or adjustment, and without such adjustment bridgework is of necessity worthless.

Another source of failure in bridgework is the imperfect articulation that is so generally obtained, stress being more frequently placed upon the outer than upon the inner cusps, thus tending to crowd the teeth against the weaker alveolar wall and gradually force them out of the mouth.

As regards the cutting off of two or more sound teeth for the insertion of a bridge, it is only a question of whether four or six teeth are better than two. It is often reiterated that we supply these teeth by a well adjusted partial plate. To say nothing of the annoyance of plates, these partial dentures have destroyed more sound teeth and produced more diseased and unhealthy conditions of the gums than all the pulpless teeth of the past generation ten times told. Furthermore, as regards cleanliness and health of the mucous membranes of the mouth, no plate can compare with a bridge whose gingival surface rests lightly upon the gum, and whose inner and outer walls are built out parallel with the abutments. This is sometimes

called a "saddle," but as saddles would indicate pressure, and pressure leads to absorption, the gum tissue can never be made to stand as a support for a bridge. The base of all dummies must only press against the gum sufficiently tight to prevent the collection of food beneath it. Such slight secretions of mucus as occur at this place will be slowly swept out without the accumulation of foreign debris. A truly self-cleansing surface must be so shaped that the base is the broadest part, not the reverse, which is the general shape given to dummies attached to crowns. The so-called self-cleansing spaces are simply sewer-traps for food and abominations to the nostrils.

Long experience has demonstrated to the writer that open-faced crowns are more difficult to construct, show more gold, and are poorer in strength than any other form of crown, while the lack of coning of the roots, which it is impossible to do in live teeth, leaves a projecting edge of band to irritate the gums and invite a girdle of decay.

I believe there are a few fundamental points upon which the profession can unite with profit to themselves and patients, and they seem to me to be as follows: All teeth to be used as piers for bridges must be made as nearly parallel as possible, regardless of the amount of tooth structure destroyed, not only to facilitate the adjustment of the bridge, but to bring the strain against the stronger alveolar wall, and to equalize the strain upon the roots to which the bridge is attached. Every root must be entirely denuded of enamel, and so coned that the circumference shall be largest beneath the free margin of the gum. All attachments for bridges should be of the banded variety, except very rarely in the case of short bridges of anterior teeth. A saddle bridge, festooned to conform to natural teeth, is the most comfortable and cleanly form of bridgework. While a permanent bridge cannot be expected if attached to worthless roots, yet such roots will last longer carrying a bridge than without it. Gum tissues can never add anything as a support for a bridge. Articulation generally should be heaviest on the inner cusps. The majority of bands cut too deeply into the interproximal space, and do not pass far enough under the gums on the buccal or lingual sides. An accurately fitted band can never be made from an impression of any kind, but must be driven with hammer and chisel upon the root it is to clasp. Gold and platinum are the most serviceable materials to-day of which to construct bridges, though it is to

be hoped that the future will bring porcelain or some allied material into more serviceable use. A swung or extended tooth is never permissible if anchored to only one root. Anchoring by spurs or extensions into fillings is always followed by loosening, friction and failure. (If anchorage is to be made after this manner, the pulp must be removed and a heavy post passed down into the canal, the coronal portion of the post constituting an inlay.) The tooth placenta or pulp should always be removed before the attachment of a crown or bridge, except perhaps in the case of very old people where nature has replaced it with secondary dentin, the tooth being without feeling, and then only when you do not expect the patient to live much longer.

I cannot refrain at this time from again calling your attention to the filthy and unscientific practice of mummifying the pulps of teeth. Of course no tooth pulp can be or ever has been mummified, but if such a process were possible it would simply entail shrinkage of the tissue; shrinkage would leave space for the infiltration of serum and fluids loaded with their organic products that would cause soreness, disintegration and trouble, even if no infection and abscess were to follow.

Will the dental profession never learn that there is no royal short cut to mechanical perfection? Can it be that our college professors are still teaching the theories in vogue during the years of their own apprenticeship? It would look so at times. Even to-day men prominent in our profession are in search of the special bacillus of pyorrhea, when this microbe is in daily process of construction in ten thousand laboratories at five dollars apiece—"made while you wait." Along this line the following quotation from Professor Lehmann's "Atlas and Principles of Bacteriology" may not be out of place. The professor says: "In every species of bacterium which is closely studied there are found closely related forms that are not rarely represented to the unprejudiced mind that are unbroken links to other species. We certainly believe it belongs to the future to convert varieties of bacteria into others in a manner hardly imagined to-day. For medical men the division of bacteria into pathogenic (disease-producing) and non-pathogenic (innocent), as is still done in the textbooks, has failed absolutely. We can understand and know the pathogenic varieties only if we study simultaneously the non-pathogenic, from which the former have once originated and

still always originate. The doctrine of the absolute consistency of bacteria, which for ten years was almost a dogma, is now hardly at all seriously advocated."

May I suggest an hypothesis which, when it becomes established, will prove the death of many reigning dogmas? It is this, that all mental conditions short of the highest, and in proportion to their distance from the highest inducing their corresponding courses of action, lead to conditions of bodily health short of the highest, and that in these conditions more and more of the ultimate vital units swerve from their proper functions and become destructive. The results of their destructive activity are in the shape of products on which existing pathogenic bacteria flourish and multiply, and on which innocent bacteria develop along malignant lines. It is along this line that one finds a rational explanation for the immunity from contagious diseases so frequently observed. It may presently be suspected in medical science that there is but one disease, not many, and that the seeming *many* are but the varied and classified manifestations of the *one*. A move in this direction was made more than a dozen years ago, when it was suggested that disease-producing germs came from innocent ones by feeding upon unsanitary pabulum.

Two eggs whose physical structure and chemical analysis are identical develop into different species. The seeds of the Rocky Ford when planted in Colorado and New York produce in each locality a very different quality of melon. Vice and virtue are conditions of latitude and longitude. Microbes, like men, change their habits and their skins, becoming like the osteoclasts, builders or destroyers, according to the soil upon which they feed and the guiding principle under which they work. Dr. Snow of the London Cancer Hospital has recently stated that a very large percentage of cancer cases, especially in women, have a distinctly traceable mental origin.

A year ago your essayist had the honor to present to this Association a paper bearing directly upon this very point; and I now rejoice to find that men eminent in the domain of bacteriology, biology and science—Professors Lehmann, Loeb, Elmer Gates of the Smithsonian Institute, and a host of others—furthering the ideas at that time expressed. The more we gather in the lines of heterogeneity in all the various fields of nature, the more we find them circling about a

common center to which they are all attached, from which they derive their origin and by which they are controlled. A physiological relationship existing between the tooth and the jaw, all the rest of dentistry is purely the work of the artisan and the mechanic, requiring the highest type of human skill, ingenuity and artistic taste.

The liberal professions are never the producers—they are the thinkers of the world, and we should master the one before we commence the other. The artist alone is the doer. When we have crossed the borders of a liberal profession, we may then pass out into the great sunlight of life among the harvesters and the reapers who are intelligently working for the benefit of the race.

I have no desire to belittle any calling—every man is working in the field to which he is best fitted—but rather to raise the mechanical and physical to the dignity to which these sciences are entitled. Let us try and rise above the narrow confines of our own little niche and recognize with Emerson—

"There is no great, no small
To the soul that seeth all;
Where it cometh, all things are;
And it cometh everywhere."

So long as the bread and butter question enters into professional work, just so long as we are compelled to fall back upon the few talents that we have developed in ourselves in our evolution from the tadpole, it is not to be wondered at that professional excellence takes the form of the groove in which it is rusting, and by which it is supported. We are inclined to do that which we can do well. We seem so helpless in other directions that our sight rarely gets above the narrow wall to which we cling. Do you wonder then that some of our teachers cling so desperately to these antiquated methods?

It is not with any great wish or expectation of converting any member of this Association to my individual views, but as a protest against some of the slovenly and inefficient methods still in vogue, that I have presented this paper. To the majority of the members of this Association, to those men among them whose attainments I honor and whose friendship honors me, I know my strictures are uncalled for; but it is to them also that I speak, for it is from them that I look for vindication and help, that the profession we follow may become a unit in practice and an honor among men.

Discussion. *Dr. J. Y. Crawford,* Nashville: This is an excellent

paper, but there are two points upon which I cannot agree with the essayist. In the first place, he ignores one of the fundamental principles upon which successful dental prosthesis rests, namely, the ability of the gum to assume the function originally performed by the tooth and roots. In the second place, his statement about the devitalization of all pulps under crowns and bridges is radically wrong. The pulp presides over the welfare of the entire tooth structure and should be preserved whenever possible.

Dr. Thos. Fillebrown, Boston: I wish to say amen to Dr. Hungerford's statement with regard to the preparation of teeth for the band. Whenever a considerable portion of the enamel is removed and the greater part of the crown is covered the pulp will die in a short time, so in all such cases it should be devitalized and removed. I wish also to agree with the statement that a tooth should be trimmed down until the circumference is largest at the margin of the gum. Occasionally a patient will present who is unable to bear the necessary grinding. In such cases a pure gold cap, reaching about half way to the gum, may be burnished on the crown so as to fit closely. The pulp of a tooth treated in this way will remain healthy.

Dr. J. N. Crouse, Chicago: In teeth which are not bell-shaped, but which grow larger toward the gum, I should trim but little, and I should not destroy the pulp unless it were absolutely necessary. If rightly treated I do not think so many of them will die as we imagine. I should rather take chances on its living than to cut the tooth down and have the root lost sooner or later, and usually sooner than later. In my scrap heap I have a large number of bridges, where the wisdom tooth, roots and all, is cemented fast in the cap, and where the whole business was easily taken out by hand, although the bridge had been well made and well fitted. I have never been able to quite decide what makes the pulp die in a tooth which has been cut down, but believe the acid in the cement has considerable to do with it. I should save the pulp wherever possible, but of course there are cases where it must be removed. One of these is where the patient is advanced in life. There is one operation which I am always reluctant to perform, and that is to cut off a sound cuspid tooth, especially for a woman, in order to use the root as the abutment for a bridge, yet it is the proper

thing to do. I have made a good many open-faced crowns, but the more I see of them the less I like them.

Dr. G. V. Black, Chicago: In addition to what Dr. Crouse has said about putting crowns on teeth with live pulps, I would state that this has been my practice for years, but it has been done with judgment. Right here I must enter an objection to this excellent paper. While it is true that applied physics is a large factor in all dental work, and especially in placing crowns and bridges, we must not use it without exercising judgment as to the present or future conditions of a pathological character due to the application of this work. Our knowledge of pathology, of disease, and of the conditions that are likely to produce it, should precede and control. The paper tends to diminish our faith in well-known bacteriological facts. While there are changes taking place in all living things, the species of microorganisms are as constant as those of almost any other varieties of life, and the essayist's endeavor to show that there is no constancy in the various species of microorganisms seems entirely wrong to me.

Dr. D. R. Stubblefield, Nashville: It is an indisputable fact that all bridgework is against nature, and we should therefore not be surprised when there are compromises on the part of nature under the circumstances under which she labors. Bridgework is in many respects the ideal compromise of the profession with untoward existing conditions, and I heartily approve of it, but when you put four teeth on a foundation which nature used for two, you have overloaded her and must not hope for ideal results. The essayist failed to state that his paper is a Utopian dream, but we should have such things, for there never was a grand practical result that was not preceded by a dream. So long as we hope for universal efforts we dream, and we waste time when we try to force all others into our line of operating rather than to impress upon them the ideals at which they are to aim.

Dr. R. H. Hofheinz, Rochester, N. Y.: I should say that a fact was never proven without a fight, especially in dental societies. If Dr. Hungerford stated that he destroyed the pulp under all conditions whenever putting on a bridge, I should say that it was a radical mistake, but I did not so understand him. I thought he stated that he would under all conditions destroy the pulp where it was necessary to secure mechanically correct foundations for his

bridgework, rather than endeavor to keep the pulp alive for a short time and have an imperfect foundation. I accord in that statement. However, to my mind the principal idea of this paper is not the destruction of the pulp or the application of the band in bridgework, but something much greater. The essayist speaks of uniformity, and alludes to the broad-mindedness of professional men. Generally speaking, if there were uniformity there would be absolutely no progress, as it is only the difference of opinion that leads to progress and to the acceptance of the best method of doing certain things. The fundamental principles of bridgework which he has laid down so excellently seem as clear as possible, yet we all frequently see cases where these primary laws have been neglected. As to broad-mindedness among our professional men, we must not forget that the very fact of living in this age of specialization means narrow-mindedness to a certain degree. This is largely applicable to dentists, and they more than any other professional men, owing to the long confinement in their offices, ought to do everything possible to exercise their minds beyond their special work. It is largely owing to a smallness of conception that so much of what is said and written at the present time passes away without effect.

Dr. J. D. Patterson, Kansas City: If anyone thinks Dr. Hungerford has given us a Utopian idea or that he is a dreamer, I wish to say that there are many in the west dreaming the same dream and carrying out the same idea. I am astonished at Dr. Black's remarks, which seem to indicate that the principles laid down and accepted in the last decade upon bacteriology shall not be improved upon in the next. This is a subject about which we know very little, and opinions are changing from year to year as investigations proceed. There will probably be more change in the future in our ideas as to the biology of bacteria and their action in pathological conditions than in almost any field of science. Every word that Dr. Hungerford has said represents the most advanced ideas upon that subject, and anyone can prove his statements by studying the conclusions of the most eminent biologists and bacteriologists of the present time.

Dr. J. E. Wilkinson: Dr. Hungerford makes a valuable point when he says that the outer cusps should not have as much strain put upon them as the inner ones in the articulation, because of the

weaker buccal alveolar wall. Of course if we make a greater slope, so as to have more pressure on the inner cusps, then instead of having a pressure at the margin of the alveolus we will have a greater pressure of the apical end against the buccal alveolus. The essayist seems to object strongly to partial plates. Some one stated that all bridgework was against nature, and in like manner all partial dentures are against nature, but there are cases where they do more good and cause less injury than bridges. I do not agree with Dr. Hungerford's statement that swung dummies should not be attached to single roots, as there are cases where this can be done. Take, for example, an upper first bicuspid, with the second bicuspid missing and no tooth below to occlude. A dummy could certainly be inserted there, or even if there were a tooth below, a dummy without an occluding surface might be used to greater advantage than a single tooth on a plate. The statement was also made that weak roots could be retained longer in the mouth by the application of a bridge than without. I would agree with that to a slight extent, and if a crown of some kind having an occluding surface were inserted with those roots, functional activity could be better restored and they could be retained longer.

Dr. M. R. Cox, Portland, Ore.: As it has been stated that the west believes in the almost universal destruction and removal of pulps, I wish to enter my protest. As regards the removal of the enamel of a tooth which is to be used as an abutment, I think that if the tooth bulges in the center it is much better to let the cap reach only to the greatest circumference of the tooth than to remove all the enamel to admit of adaptation at the gingival border. The plea for uniformity of action in this paper disproves to my mind the idea of the general extirpation of the pulp. There are probably not more than a dozen here who employ the same method in the treatment and filling of root canals, which goes to show that all of us recognize the untoward results from this operation.

Dr. M. L. Rhein, New York: I agree with Dr. Patterson that the beliefs concerning bacteriology and pathology must for years to come be tentative, and the scientific world to-day recognizes the fact that we must be ready to change our views at any moment in accordance with new discoveries. I do not believe that Dr. Hungerford places himself in an attitude where he fails to see the different conditions that may present in practice, but the point that he has

brought up so clearly is one that is becoming a byword to American dentistry, namely, the abuse of crown and bridgework. We recognize the value of these aids, but when a crown is placed over a tooth that could be filled without danger to the pulp, or where a bridge is put on in a case where the root could be restored, or when the work is done years before there is any necessity for it, American dentistry is disgraced. It is time the ethical men of the profession and the dental associations should adopt some means to put a stop to this wholesale destruction of teeth.

I say unhesitatingly that when a tooth must be crowned it should be properly prepared, and Dr. Hungerford has outlined the method. Our scientific work has failed thus far to show us the pathological conditions that exist in the pulp from the time of the first attack in a slight form of pulpitis. Dental investigators are just beginning to tell us what stages precede the seed-like deposits that we find in certain pulps when removed. We should remember that these operations are permissible at a time when, owing to the age of the patient, the formative period of the teeth has ceased. I do not underrate the disadvantage of removing a pulp from any tooth, but it is the lesser of two evils. We all know the result of placing a gold cap over a tooth from which the enamel has been removed, and before the dentin is covered with a substance which by its thermal action permits free passage of outside influences the pulp should be removed. I disagree with Dr. Cox on the subject of root treatment, for if clinical dentistry has accomplished one thing in the last twenty years it has enabled us to treat and fill roots in a fairly uniform and scientific manner.

Dr. James McManus, Hartford, Conn.: Dr. Black touched the vital point when he stated that all these operations should be performed with judgment. I do not doubt that Dr. Crouse has a large collection of bridges that were failures, and I suppose every dentist of considerable practice has many such. These bridges were failures because they were put on by men without judgment, without care, without ability—in fact, without anything except the desire to do something that looked like dentistry. We should never insert a bridge without studying well the models and the articulation. If this were done crown and bridge work would not be the disgrace to the profession that they are to-day.

Dr. J. P. Root, Kansas City: A year ago I read a paper before

one of the sections of this Association along this same line. I claimed, as does Dr. Hungerford, that in all crowned teeth the pulp should be destroyed, except occasionally in the case of bridge attachments, but I further say that with rare exceptions no tooth should be crowned where there is a chance to fill. Where it is not necessary to destroy the pulp the tooth does not require a crown, and when we all learn to practice what some of us preach there will be no occasion for so much useless discussion of this subject.

Dr. Emory A. Bryant, Washington: Dr. Hungerford argues that a man must eliminate his personality and work along one line, but this is a practical impossibility. I cannot comprehend where these men get the idea that the pulp must be destroyed in every tooth that is crowned. They remind me of the men who run down bridgework and say, "You destroy the living tissue when you crown the tooth," but who advocate the use of a pair of forceps to prepare the same mouth for a plate. They decry bridgework because in some cases there is resulting filth, but the same men will put in a rubber plate, which is the filthiest thing in the world. Why is it that the man who advocates removal of the pulp in crowning operations will hammer away for four or five hours on a large contour filling which contains more gold than a crown. The thermal action is greater in that filling than in the crown, because it is closer to the pulp. The same man will advocate a porcelain filling to avoid a show of gold. It is not the gold upon the surface of the tooth that kills the pulp, but the phosphoric acid in the cement, and why would the acid not have the same effect when used to set a large porcelain filling? I do not believe that we must bind ourselves to any one method in crown and bridgework. Our work should be an art as far as possible, but our first duty is to give our patients the greatest amount of satisfaction and the best service. When necessary we should sacrifice art for strength and utility. I have no faith in this gingerbread work, but believe in putting something in the mouth that will remain there.

Some men have taken exception to the self-cleansing surfaces of bridgework. A few years ago Dr. Rhein invented a system of removable bridgework, but I have not heard of it since. As regards the self-cleaning surfaces of teeth in bridgework, if the bridge is constructed as it should be, with due reference to all the tissues, it cannot help but be perfect in its action. The trouble is that the

majority of dentists do not open the bite in a case of abnormal articulation, but accept the mouth in the condition in which they receive it, and put in a bridge on one side without changing the bite on the other, although the bite may be very close. They cannot do this without inflaming the tissues and making the bridge a receptacle for filth. If you will open the bite and restore the mouth to its original condition you will obtain a self-cleansing surface. I have one patient who will not keep his teeth clean and you cannot see the bridge therein for the filth.

Dr. F. B. Noyes, Chicago: The human mind has a tendency to swing from one extreme to another, and we are apt to think that a single new fact disproves everything previous. On the contrary, in the scientific world there are few revolutions and there is a continuity in the development of thought. Each fact discovered takes its harmonious place with what has preceded it. Heterogenesis as a biological fact was disproven long ago. There is nothing more fundamental in biology to-day than the universal law of heredity, namely, that all living things are derived from similar living parents. A correlative with this fact is the law of variation—that no living thing exactly resembles either of its parents. Up to the last decade the study of bacteriology was concerned with the identification of species and their relation to certain diseases, which latter has been proven. In the future we shall not overthrow those beliefs, but will study the modification of the species by its environment. Bacteria resemble other organized things in that their environment affects their functions. Biologists to-day recognize that all the phenomena of life presented through the cellular organization are but exalted chemical reactions, and that these reactions are dependent upon the reagents present. By changing the food of a poisonous snake its secretions may cease to be venomous, but give it again its proper food—restore its natural environment—and its bite will be as poisonous as ever. The same thought applies in bacteriology. Certain germs produce given diseases under certain conditions, but not under others, but it cannot be proven that tetanus bacilli can produce tuberculosis. The same disease may be produced by different germs, and the same germs may under varying conditions produce what are recognized as two diseases, for instance, croup and diphtheria, pulmonary pneumonia and pericarditis, but that

does not annihilate the identity of species nor establish heterogenesis in biology.

Dr. N. S. Hoff, Ann Arbor, Mich.: In substance the essayist stated that a man who has habitually followed one line of work, such as operative dentistry, is thereby disqualified to mutilate the teeth for the proper adaptation of bridgework. Some have further stated that not only are artistic ideals to be wholly set aside in making crowns and bridges, but also many of the physiological principles upon which they should be constructed are to be subordinated to mechanical rules. It seems to me that the artistic aspect of this subject should be given its due proportion of consideration. I cannot bring myself to mutilate or destroy tooth structure for the purpose of making some particular form of bridgework. I believe in bridgework and think it should be made as substantial as possible, but that is not the paramount issue at stake—rather the artistic restoration of the existing conditions. This attitude, as the essayist has indicated, may come from my training as an operator or as a conservator of the dental organs. This discussion has emphasized the fact, as stated by Dr. Black, that we must use judgment in all crown and bridgework, and has given us one of the strongest possible arguments for broader culture—a culture which will make every man who undertakes any operation in dentistry the possessor of a judgment which will enable him to at least approximate the best results. Such judgment cannot be obtained by adopting the ideas of any one man or by looking at the matter only from the mechanical, the physiological or the artistic aspect.

Dr. Black: For the last ten years there has been a great effort among bacteriologists to trace the changes presented by those forms of microorganisms which show variations in form or function, and it has been found that there are many germs which present some of the characteristics of insect life, appearing first in one, then in another, next in a third form, and then repeating the cycle. The work and the conclusions seem to have been taken by some to indicate that the forms of microorganisms are uncertain, but the conclusions reached up to the present time determine the fact that these germs, although changing in their character, are still as reasonably certain as are other forms of life.

Dr. A. J. Flanagan, Springfield, Mass.: The fundamental principle of bridgework is that we are dealing with live and not immov-

able objects. Men who can make a beautiful bridge on a dummy case cannot necessarily do as well in the mouth. As I understand it, the question reverts to the statement made three years ago by Dr. Hungerford, namely, that it is better to remove the pulp with the tooth in a normal condition than to defer the operation until it is forced upon us by abnormal conditions. This statement has never been refuted. As regards crowns causing death of the pulp, these questions arise: First, is it caused by grinding down the tooth? Second, is it caused by the medium with which the crown is set? Third, is it caused by a pathological condition outside these mentioned? Before we can arrive at any conclusion as to the best method to be adopted in crown and bridgework we must ascertain definitely what causes death of the pulp.

Dr. Rhein: Dr. Bryant spoke about a form of removable bridgework which I devised. It was never my intention to introduce it as something which should become a system, but it was intended to take the place of the sort of bridgework that he mentioned, where the bridge could not be seen because of the filth covering it. The form of bridgework which I introduced has been used by a number of men, and from the principles then elucidated the Griswold system has been evolved. Proper judgment should be used in determining whether a fixed or removable bridge should be inserted. Dr. Bryant certainly condemned himself when stating that he put a fixed bridge in the mouth of a patient who would not keep it in a sanitary condition.

Dr. G. D. Sitherwood, Bloomington, Ill.: Bacteriologists tell us that certain germs are always present in the mouth, and that under given conditions they become pathological and do harm, so Dr. Hungerford has advocated this particular style of bridgework, not only for mechanical and other reasons, but so that no lodgment will be afforded for debris that will feed these germs and cause them to become pathological. Dr. Hungerford did not set forth a specific plan for making bridges, but he laid down universal principles that we should all recognize and work out in our own individual way.

Dr. Crouse: I consider the cause of failure in bridgework to be the loss of the peridental membrane. This is what makes bridges come out with the roots and all attached, and anything that will obviate this inflammation and loss of tissue should be looked into.

Dr. Bryant: In answer to Dr. Rhein, I have done something

myself in the line of removable bridgework, and as regards the patient with a filthy mouth, the same trouble existed with a removable as with a permanent bridge, for he would not take out the removable bridge to clean it.

Dr. A. C. Hewett, Chicago: We can all earn a lesson by looking at the three bridges which span the Niagara river. One is a suspension, another a cantilever, and the third an arch. The engineers who planned them knew exactly what was needed at the various points; also what would best meet the needs, and each bridge is doing its work perfectly. It would be senseless to make them all alike or to substitute one for another. It is just as senseless to say that all bridges in the mouth must be made just the same and upon the same principles. So long as there are differences in the teeth, gums and alveolar processes upon which we operate, so long there must be differences in the structures which we build and the methods we employ. We might just as well plead for uniformity in the shapes of fillings as for the uniformity in bridges.

Dr. S. W. Foster, Atlanta, Ga.: The cause of many failures in bridgework is the irritation of the periosteal lining of the roots by the edge of the crown impinging upon the gingival margin and periosteum. Frequently we do not use sufficient care in shaping the edge of the crown which goes below the gum line. I am strongly in favor of retaining the pulp in its normal, vital condition as long as possible, but if we adopt the essayist's statement that in preparing abutments all the lines must be parallel, we must devitalize the pulp much more frequently than where inclined planes are used. It is a principle in mechanics that two approaching inclines are stronger than two parallels, and in many cases, especially with the second and third molars, better results are obtained from inclines than from parallels.

Dr. Hungerford, closing discussion: In no great movement of science or industry can you expect to find all your confreres broad-minded. The surest sign of progress is when you can be kindly disposed toward those who are opposed to you, and an infallible indication of retrogression is when you expect every man to think and act as you do. It would take a week for me to answer all the points that have been brought up, and as my advocates and opponents have been about equal in numbers I will leave the matter to you for settlement. However, there was not the appreciation of

the effort which I made in pleading for uniformity that I hoped for. It is well recognized in medicine that while one physician may prescribe quinin, another phenacetin, and a third antifebrin, all agree that in certain diseases antipyretics are necessary, and those diseases are well established. As a profession we should unite upon certain standards and say when certain operations should or should not be performed. Until we can do so our practice of necessity will be more or less empirical.

I believe that most bridges are lost because of periostitis, and I think that fifty per cent of the diseases of the periosteum could be prevented if the teeth were deprived of their placenta after they are born. When the pulp has fulfilled its normal function of depositing dentin it ceases to perform any further physiological action. After the tooth has grown the pulp is as useless as the enamel membrane, but fortunately for the individual the latter is worn off shortly after the tooth is erupted. The pulp, on the other hand, remains on the inside until some dentist irritates the terminals of the fibers either chemically or mechanically, when it makes a more determined effort to eradicate itself, and in that effort dies, and through continuity of structure, irritation and loss of the peridental membrane naturally follow.

It seemed to me that Dr. Noyes took both sides with reference to the biology of bacteria. How is it possible to believe in the consistency of bacteria or of any class of living things if you believe in evolution, for the germs must change with their environment and under the conditions in which they live, and where they are hampered in their growth they must undergo changes. If there was one thing that I especially emphasized it was the idea that these new theories, while perhaps not thoroughly true, are worthy of our most earnest consideration. Dr. Black does not like to hear any new theories promulgated that will tend to disrupt the profession. If the new ideas are true they will not disrupt the profession and we want to know them, and if they are false we shall soon find it out. There is such a thing as clinging to old methods because we do not know anything else, and because we have journeyed so far along one line that the dust of the road has blinded us and so clogged our wheels that we cannot bend our energies to the newer things.

MAXILLARY FRACTURES.

BY ROBT. T. OLIVER, D.D.S., MANILA, P. I. READ BEFORE NATIONAL DENTAL ASSOCIATION, AT NIAGARA FALLS, JULY 28-31, 1902.

The subject of maxillary fractures is one fraught with considerable interest, both to the general practitioner of medicine and surgery, and to the specialist of oral or dental surgery. To many of the former these cases are highly undesirable on account of the extreme difficulty of management, coupled with the uncertainty of accomplishing perfect results. To the oral surgeon, who perhaps is better able to cope with the peculiar characteristics of these cases, on account of his intimate knowledge of and familiarity with the parts involved, and his accustomed dexterity with the instruments, appliances and materials necessary in intra-oral operations, the average of perfect results is much greater.

The primary requisites for this class of fractures are essentially the same as for any of the "Osseous solutions of continuity" of long bones, namely, Reduction, Fixation and Immobilization.

In passing, it may be of interest to know that while these factors in the treatment of maxillary fractures were undoubtedly known and recognized long before the days of Esculapius and his associates, it was not until centuries afterward that the famous Ambroise Pare, successively known as the "Barber Dentist," "Army Surgeon," "Surgeon to the King and Surgeon General of the French Armies," in 1569 promulgated theories and developed practical methods for the accomplishment of these points which are sufficient proof that his ideas were advanced far beyond his era. His method of wiring the fragments in position, and then wiring the upper and lower teeth together, so as to tightly close the jaws with teeth in original occlusion, for the prevention of deformity and the reestablishment of the plane of articulation, is worthy of emulation at this late date.

Fractures of the inferior maxillary bone are the most common form of all maxillary fractures, and it is to this class of cases that I invite your attention. Statistics show us that this bone is fractured more often than any other bone of the face. By reason of its size, shape and location it seems to invariably receive the majority of blows and the heaviest force of impact, and in over 95 per cent of cases it is fractured by external violence. Men are ten times more liable to fractures of this bone than women, owing to their more hazardous occupations, with increased exposure to violence.

Fractures of the inferior maxilla may be classified into simple, multiple, compound and comminuted, and may be of a perpendicular, horizontal, oblique or transverse variety; occurring through the symphysis, body, ramus, coronoid, condyloid or alveolar process. The great majority of fractures caused by violent impact of force upon either the chin or side of jaw occur usually through or near the socket of the long cuspid tooth or the mental foramen, as these localities are ordinarily the weakest points of the body of the bone.

Symptoms.—The five cardinal symptoms in the diagnosis of fracture of the inferior maxilla are: 1. Pain. 2. Deformity. 3. Crepitus. 4. Impaired function. 5. Faulty articulation of teeth. These are accompanied by some or all of the following accessories of diagnostic value: 1. History of patient having received a blow, kick or fall upon that side of the face or head. 2. Patient's inclination to hold jaw up with his hands in his efforts to speak or swallow. 3. Patient's acknowledgment, when attention is directed to it, of a peculiar numbing pain through half of lower lip and angle of mouth, indicating paralysis of mental branches of inferior dental nerve, produced by pressure upon or tearing of nerve trunk by fragments of bone. 4. Profuse salivary secretion.

The popular treatment of these fractures by the medical fraternity in the past has been: First, reduction (or I prefer the term "adjustment") of fragments; and, second, the molding of pasteboard, leather, gutta-percha, or other form of mental splint, with side pieces extending backward along the body of bone; this external splint being held in position, with jaws firmly closed, by some form of occipito-mental bandage. This method in general has no doubt many advocates to-day who point with pride to the successful results obtained by it, but who is there to pass judgment upon the completeness of those results, and how many of the patients would present deformity and impaired function, with impossibility of perfect mastication, due to the false planes of articulation?

While this method is to be highly commended for the good it has done in the past, its era of usefulness is rapidly passing, and we have arrived at a time when intra-oral counter pressure is regarded as a necessary adjunct to combat such possibilities as deformity, impaired function and false planes of articulation. A time when the specialties of medicine have asserted themselves, when competent dental surgeons or specialists in oral surgery should either be called for consultation in these cases or should have the full control of them.

Permanent Interdental Splints.—The various forms of interdental

splints or modifications of them, whether wire, metal, vulcanite or celluloid, are constructed to fit over the teeth, to preserve the exact contour of the arch, plane of articulation, and to exert a counter pressure to external bandages. They are indicated in all fractures of the inferior maxilla, except those unusual ones occurring through the coronoid, condyloid or ascending ramus, and should be used in conjunction with and accessory to firm bandaging. Then the possibility of producing perfect results, such as firm union of bone, restoration of contour, reestablishment of articulating plane, with consequent restoration of masticating surfaces, is assured.

The main objections to the ordinary form of interdental splints are: First, difficulty in obtaining accurate impressions of the teeth, accompanied by the production of considerable pain to the patient; second, the length of time that must necessarily elapse before the appliance can be manufactured and be ready for insertion, for it must be remembered that if made of metal by any of the various processes of swaging and soldering, or even of vulcanite rubber, which perhaps is the simplest form, several hours have elapsed, during which the patient has suffered, not only from the pain of the primary "solution of continuity," but from malposition of the parts, due either to contraction of the muscles or the action of gravitation, operating upon a point of non-resistance. Usually he also suffers from mental distress over the anticipation of dreadful things yet to happen when the appliance is inserted.

The permanent interdental splint, however, has supplied a long-felt want, and has met the perplexities in the treatment of maxillary fractures in a splendid manner, for which all honor is due to those men of the dental profession whose ingenious minds and skilled fingers have met the emergencies so squarely. These appliances are truly indicated in many cases to-day, especially in those which are presented many days after the occurrence of the fracture, for by this method a marked deformity, either of the bone contour or articulating plane, that has become semi-solid by reason of a thick callous surrounding it, can be beautifully remedied in the following manner:

Take impressions of the teeth regardless of deformity, and make casts of each jaw. Saw through lower cast along line of fracture, consequently through line of deformity, separate segments of cast containing the teeth out of alignment, replace this segment in relation to rest of cast, so as to restore contour of arch and plane of articulation, and hold in place (temporarily by wax) until the position is

verified by occluding with cast of upper teeth. The small facets on the teeth, produced by long masticatory action, act as guides in replacing teeth on the segment in the original position. Now carefully remove wax and firmly fasten segment in correct position with cement; then proceed in the usual manner, waxing up, flasking, packing, vulcanizing and polishing. When ready for insertion the false position of the fragments of bone can be broken up by the proper direction and application of force, with the patient anesthetised if necessary. The parts can then be molded into new position, the teeth made to fit into their several receptacles in splint, upper teeth allowed to close into their receptacles, and jaws held in that position with an occipito-mental bandage. A Gunning splint or modification thereof is best indicated for the purpose.

One of the best forms of permanent interdental splints, for use in simple fractures occurring anterior to the ramus, is the Kingsley or some modification of it, which fulfils all the requirements of a splint, in holding parts in correct position, preserving perfect immobility, and giving the proper intra-oral counter pressure. At the same time it permits the patient to enjoy more latitude in the selecion of diet, as he is able to masticate the softer foods, and it also gives greater freedom in the exercise of his face and jaw muscles, which are inclined to become stiff and painful when tied up for three or four weeks, as with a Gunning splint. It also permits of better facilities in the way of cleanliness and prophylaxis.

Writer's Method.—With a full realization of the importance of the following five cardinal points in the treatment of fractured jaws—1. Adjustment. 2. Fixation. 3. Immobilization. 4. Aseptic prophylaxis. 5. Rest and nourishment—the writer begs to present the following method, to which he lays the claim of originality, and with which he has met with marked success in a large number of cases: After the usual examination of jaw and determination of the line of fracture, ascertain the exact condition of the teeth immediately adjacent to the line of fracture, paying special attention to two things—that the crowns are not broken or roots split, and that they are firm and solid in their sockets. Then begin moulding the parts into position, restoring contour, plane of articulation, and bringing the broken ends of the fragments into direct apposition and perfect adjustment. An assistant must now hold the jaw, mouth open, preserving the alignment, adjustment and contour of the reset bone, which can best be accomplished by assistant standing behind

patient (if in an upright position) grasping from below each angle of the jaw in such manner as to allow the third and fourth fingers to support from below, and clutch firmly from within outward on the posterior fragment, allowing the second finger to do likewise with the anterior fragment, while the thumb and forefinger holding from the outside likewise support and retain the apposition and alignment, as in the manner of a long splint. If the patient is anesthetized and in a recumbent position, then the assistant must stand at head of table, taking same grasp as nearly as possible, remembering in either event that continuation of undisturbed adjustment is of the greatest importance.

Suppose, for example, the line of fracture exists between the first and second molars, and for the sake of expediency, imagine the adjacent teeth to be unbroken, firm and solid. I manipulate the jagged ends into perfect apposition, and restore alignment of bone and teeth, reproducing normal contour and normal plane of articulation. I now take a piece of 18-gauge, pure silver wire, about six inches long—preferably a Fleurs bone suture—sharpen each end, bend it at right angles about two inches from one end, and carefully insert the short end from without inward through the interproximal space between the second and third molars. If the third is not in position, form a loop around second molar, pulling the short end round to the angle of wire, bringing the long end close up, and touching the buccal surface of all the teeth on that side, with end projecting anteriorly beyond the incisors. By carefully shaping the short end, that now extends well into the mouth, I make it into a staple, insert point from within outward, between first and second molars, and draw taut, so that it conforms to contour of lingual and both proximal surfaces, or if necessary it can be burnished to place. The short end is now twisted to shank of long end, by about two good turns with a long-beaked, flat-nose plier, at the mesio-buccal angle, forming a snug-fitting loop which firmly grasps the tooth at or perhaps just below the gum line. The long end is now pulled forward, inserted from without inward, into interproximal space between second bicuspid and first molar, pulled taut, burnished to conform to buccal and mesial surface, grasped again from inside, pulled backward, inserted from within outward between first and second molars, pulled taut, burnished to lingual and distal surfaces, and twisted with the half-inch stub of short end in such manner as to bring retained traction directly through broken ends of bone, along

the line of its axis, with such firm, steady force that the bone maintains its original alignment and contour, presenting a normal appearance. If greater strength is required, take in two teeth on either side of fracture by a figure 8 weave with the same method of twisting ends for traction. The jaws are now carefully closed and firmly held in that position by the assistant until commencement of next step.

If it were not for the loosening effects of consequent inflammation, the liability of unequal pressure due to muscular contraction, or the patient's probable bungling efforts in eating, this adjustment might be all that is necessary for completion of cure, but it is advisable not to stop here, but to proceed in obtaining more complete fixation of parts beyond the possibility of disarrangement, utilizing this wiring process as a primary factor, useful only in temporarily holding the acquired adjustment, after the digital manipulation has secured a restoration of alignment, contour, apposition and plane of articulation.

I next take gutta-percha or modeling compound, rendered plastic by hot water, select a piece about 1½ inches long and ⅝ inch thick, into which I incorporate a small section of hard wood ½ inch long and ¼ inch in diameter, placed about ¾ inch from one end. Then introduce the plastic into mouth (which is wide open) the wood end first, carefully placing it between upper and lower teeth, then allow teeth to close into it, moulding the plastic with fingers and instruments outside, and with little finger inserted between incisors contouring it concavely inside, giving greatest amount of space for tongue. By application of cold water or cloths the material is chilled and becomes hard, firm and inelastic, making an excellent interdental splint which will absolutely hold the parts to their adjustment. This splint is now carefully removed (assistant holding jaw from behind), trimmed up, presenting smooth, round, thick edges, to avoid crumbling, and reinserted, the teeth fitting into their original positions.

The wood is used for two reasons: First, to act as a "stop," preventing complete closure of teeth through plastic compound, which would interfere with the feeding of patient and hygienic cleanliness; and, second, to act as a fulcrum over which leverage is constantly exerted by contraction of the anterior fibers of the masseter muscle, assisted by the counter external pressure of bandage, which over-

comes the possible contractive drag of the digastric muscle, and force of gravitation, and supports the long, heavy, drooping anterior fragment, keeping it tightly sprung up into position, while at the same time the posterior fragment, which invariably tends to draw up and out of alignment, on account of contraction of the temporal, masseter and internal pterygoid muscles, is firmly held down and prevented from shifting its position by coming in contact with this resistance. I regard this second reason as a most important factor in using plastic interdental splints, for by its use in the proper position (always on the posterior fragment) we are enabled to feel an assurance that this fragment will remain in the corrected position. By this method we can successfully treat fractures by an interdental splint, with all the advantages of absolute fixation, opportunities of feeding, possibilities of hygienic cleanliness, and tolerable comfort to patient, without the worry, care, labor and consumption of time necessary to take impressions, construct models, wax up, flask, vulcanize and fit a permanent splint, not to mention the pain and discomfort of patient in so doing.

The jaws are held in position by application of an occipito-mental bandage, preferably of plaster paris, either of Barton or figure 8 variety, using a five-inch square of rubber dam or oiled silk in position as a protection or bib, covering that portion of bandage lying below the lower lip. This is placed in position by laying it flat over the face before the bandaging is commenced, the lower border even with the chin, allowing the various layers of the bandage to cover it. Afterwards it is turned down over that portion of the bandage below the lower lip and protects it from becoming foul by absorbing saliva, medicine or food, and is easily kept clean and sweet by frequent sponging with an antiseptic solution.

ORTHODONTIA—LITERATURE OF THE YEAR.

BY W. E. WALKER, D.D.S., NEW ORLEANS. READ BEFORE THE NATIONAL DENTAL ASSOCIATION, AT NIAGARA FALLS, JULY 28-31, 1902.

Etiology.—A valuable contribution to the subject of the development of the maxillæ and teeth—the Influence of Nasal Obstruction—(1) was read by Gordon King, M.D., before the New Orleans Academy of Stomatology, in November last. The subject was selected by Dr. King as being one of equal interest to the dentist, the

orthopedist and the rhinologist, and hence one of the material links tending to bind the professions together. He said that while to the dentist the chief importance attached to remedial measures to be applied, to the rhinologist is assigned the honor of having discovered the essential cause, and of applying the greatest of all remedies—*prevention.* These patients are as a rule seen by the dentist only when the deformity has already taken place, and the permanent teeth have erupted in irregular arrangement. Upon the rhinologist falls the burden of responsibility of laying proper stress upon the importance of abnormal conditions which may tend to a perversion of normal development; conditions the symptoms of which are too often overlooked or undervalued by parents.

Nasal obstruction, whether only partial or complete, leads to a compensatory habit of mouth-breathing, with all its deleterious effects, especially upon the development of the maxillary bones. That the most frequent cause of nasal insufficiency in children is the growth of adenoid vegetations in the naso-pharynx is universally admitted. A catarrhal state of the nasal and pharyngeal mucous membranes, and a more or less constant congestion of the upper respiratory tract, invariably accompany the presence of adenoids. The coexistence of hypertrophied faucial tonsils also affects the nutrition of adjacent organs. Next in frequency to adenoid growths is obstruction due to malposition and hypertrophies of the nasal septum, a thin plate of cartilage and bone especially prone to traumatic injury. When from these and other causes the habit of mouth-breathing is formed and the nasal functions are destroyed, the accessory cavities to the maxilla, the frontal and sphenoidal bones, whose functions are intimately connected with those of the nose, are arrested in their formation; the alæ of the nose atrophy from disuse and readily collapse against the septum, causing a partial vacuum in the nasal chambers, diminishing the resistance to atmospheric pressure from without, and causing a congestion of blood in the highly vascular lining membranes. This leads not only to a derangement of local nutritive processes, but the entire system is to a certain degree affected in consequence. But of especial importance to us as orthodontists, said Dr. King, are the irregularities in the form of the palatal arch and the arrangement of the teeth, which are held to be familiar consequences, the abnormally high vault; the V-shaped arch; overlapping and prominent incisors; malposed cuspids; thin

nose and flattened cheeks. The growth of the superior maxillæ is retarded; the lateral alveolæ approach each other as the anterior portions advance forward; the lateral incisors, cuspids and bicuspids are deranged in position. Dr. King discussed at length the various theories set forth as explaining the development of the abnormally high arch, according great weight to the influence of septal deviations, giving to post-nasal adenoids the first place as an etiological factor in the septal deviations of childhood. He said too great importance cannot be attached to free nasal respiration in childhood, and to an early recognition and treatment of conditions that produce nasal insufficiency. In conclusion he said, "We should always bear in mind that the ability to recognize conditions that may lead to disease or deformity bears with it a moral responsibility to which we should never be indifferent."

A paper by Nelson M. Black, M.D. (2) is worthy of the attention of everyone interested in this subject.

Dr. F. Parke Lewis read a paper on the same subject before the New York Institute of Stomatology. (3) He said, "Clinically the relationship between adenoids and deformities of the face has been so constantly observed that the facial appearance has come to be accepted as a characteristic indication of the presence of adenoid vegetations in the naso-pharynx." Dr. Lewis, however, takes a reverse view to that generally accepted, believing that in many cases a narrow head and face, produced by any means whatever, will naturally result in obstruction of the lymph passages, with all the varied and unfortunate phenomena which such obstruction implies. This being admitted, its import to the orthodontist is obvious, also the importance of recognizing even the less striking of these cases.

In the discussion of the paper Dr. Wendell C. Phillips stated that on an average one child in every eight or ten had adenoid vegetations, this being so out of proportion to the number presenting dental deformities that it seems rather to oppose the generally accepted theory. Dr. Lewis considers it the exception, rather than the rule, that adenoids are the cause of high arched palates. Dr. Haskins thought that adenoids are often due to improper infant feeding, disturbances in the digestive apparatus being followed by congestion of the lymphatics of the mucous membrane.

Dr. Mayo Collier, in an address (4) on this subject delivered before the British Laryngological, Rhinological and Otological Asso-

ciation, said—"The association of mouth-breathing with high palate, unsymmetrical upper jaw, prominent nose, open mouth and thin, flattened face is a constant one. I am old enough now to have seen many children with beautifully formed faces, symmetrical dental arches and perfect nasal respiration become in after-life quite altered. The upper arch becomes so distorted that the molar teeth on each side are approximated, so that the teeth of the upper jaw rest only by their edges on the teeth of the lower jaw, whereas the incisor teeth of the upper jaw protrude forward and hang in front of the incisor teeth of the lower jaw. The whole of the upper jaw may become atrophied, the nasal respiration almost entirely suspended, the palate highly arched and V-shaped and the mouth constantly open. Why this change? * * * Hereditary tendency did not exist, the parents having remarkably well-formed upper jaws and being particularly good-looking. I can produce the same effect on any young animal chosen indiscriminately, by blocking its nose for a long time with cotton-wool. Is it unreasonable to suggest that turbinal atony and hypertrophy in the young and growing subject will act as the piece of wool in the nose of the young animal? * * * A small increase of pressure from without, constantly applied on the walls of the nasal box, is capable of pushing up the palate, disarranging the upper arch and causing general atrophy and an undeveloped condition of the whole upper jaw. Moreover, if these cases are taken at an early stage and the nasal respiration is restored, the constant stream of air passing through the nose molds and expands the upper maxillæ, and in time the greater part of the deformity will disappear."

Dr. Herbert A. Pullen, in closing the discussion of his paper (5), read before the Sixth, Seventh and Eighth District Dental Societies of New York, said that in his practice all cases of mouth-breathing were referred to the rhinologist, he refusing to undertake the correction of irregularities until the rhinologist pronounced the post-nasal condition good. He said—"The effect of mouth-breathing is to cause the elongation of the molars because of the constantly open mouth. This of course produces an open bite, and the upper lip, relieved of tension, is shortened. The effect is pronounced, because as pressure is removed from the anterior teeth the jaw is narrowed, the occlusion destroyed, and in consequence nutrition is interfered with."

Dr. H. E. Lindas read before the Kansas State Association "A Study in the Etiology of Malocclusions." (6) He divides malocclusions into two classes; 1st, those which cause, and 2nd, those which are caused by, deformities of the maxillary bones. The first class includes those caused by pernicious habits in childhood and injudicious extraction, the results being generally confined to the alveolar portions, except those caused by premature extraction of deciduous teeth or extraction of permanent teeth before the jaws are developed. They are not infrequently intensified by attempting correction through extraction, thus destroying the mathematical perfection of the occlusal harmony. Deciduous teeth that are sensitive to pressure may indirectly cause malocclusion in the effort to avoid contact, the child taking advantage of the sliding movement of the temporo-maxillary articulation, and advancing the lower jaw until the habit is formed. In the second class the maxillæ may be either under or over developed as compared with the teeth, underdevelopment being by far the more prevalent. Diseases which effect malocclusion originate in the nasal fossæ, tonsils, and occasionally in the maxillary sinus. Adenoid growths and hypertrophied tonsils, causing stenosis of the nasal passages, cause characteristic malocclusion. There is seldom any evidence of underdevelopment of the maxillary bones before the sixth or seventh year, the age at which the child is peculiarly susceptible to hypertrophy of the fauces and tonsils. The maxillary bones then fail to respond to the demand for more room for the increased size of the permanent as compared with the deciduous teeth. Dr. Lindas concluded his paper by saying—"Practically all malocclusions are acquired, and by the elimination of extraction as a procedure in correcting malocclusions, and of inheritance as a factor in producing them, we may hope to make orthodontia an exact science."

Extraction—Pro and Con.—Dr. W. D. Tenison (7), while disclaiming a radical standpoint, describes certain conditions under which extraction apparently becomes a duty. For instance, when a child is suffering from toothache, with exposed pulps in first molars, teeth of poor quality and showing tendency to decay, crowded and in abnormal position. Nonextraction would necessitate devitalized first molars, expansion of arch to ease off the pressure, separate points of contact, the wearing of retaining-devices, a source of danger to poor, soft young teeth; and the risk to the health of a delicate

nervous child. On the other hand, extraction of all four first molars at the age when second molars are about to erupt offers a few years later "as near as possible a perfectly regular set of teeth, good articulation, little or no decay, not a dead tooth in either jaw, perfect comfort to the patient, who is able to masticate food perfectly, and, so far as the teeth are concerned, in perfect health, with no flattening or contracting of the arch, no straightening or shortening of the teeth, as has been claimed by those who denounce extractions."

Dr. Herbert A. Pullen, on the other hand, in the paper before referred to, on "Conservative Treatment in Orthodontia," says, "The most important tooth to preserve is the first permanent molar, especially the lower, yet its extraction because of caries seems to be a favorite and all too frequent practice. Its loss is followed by more serious results than that of any other tooth. * * * The four first molars are the foundations for the developing arches, both as to lateral and forward development, as well as preserving the proper relation and distance between the two arches until the remaining permanent teeth have erupted, and have been guided into position, confirming the occlusion already established by these four bulwarks of the dental arches."

In the discussion of this paper Dr. Eschelman (Buffalo) was strongly opposed to the extraction of the first molars. He said—"The first molars act as props to keep the jaws open till permanent teeth come in; they constitute the base of the arch of the jaw, and their removal disarranges the arch." Dr. Webster (Toronto) said, "Nearly all dentists are agreed that the anterior teeth should never be extracted in regulating, but too many are willing to sacrifice bicuspids to make room to correct irregularities. It is hard to conceive a case where such a sacrifice could be justified and the consequences are usually most lamentable."

Dr. R. E. Sparks, in a paper read before the Ontario Dental Society (8) discussed the indications for extraction or retention of the first molars, reaching the conclusion that it is impossible to lay down a set of rules which will cover all cases. In the discussion of the paper Dr. Pullen gave the following reasons for nonextraction—1st. They are the first of the permanent teeth to erupt, and during the period of absence of the temporary dentition afford the broadest and the best masticating surface in the mouth. 2nd. By reason of their great strength and size, these are the only teeth that can serve as a

means of preserving the normal relationship between the jaws, and consequently the symmetry of the face, at a time when no others of the permanent set, except the incisors, are erupted to occlusion. 3rd. Their presence is an aid in securing developmental pressure in the development forward of the jaws. 4th. Statistics comparing the relative frequency of caries between the first and second molars prove the second molars more frequently carious than the first. 5th. The first molar, on the average, is a better constructed tooth than either the second or the third molar. 6th. Its extraction is the cause of more irregularity than is generally supposed. He said—"Irregular teeth do not straighten themselves simply because the first molars are extracted. Extraction of the first molars before the eruption of the second will many times shorten the bite, allowing the jaws to come closer together, the bicuspids not being allowed to erupt fully; the undue pressure on the upper anterior teeth causing their protrusion and the lower to come in contact with the gums above. Even when symmetrical extraction of the first molars has been performed, with the view of their replacement by the second molars, it happens more often than otherwise that the second molars tilt forward into the space, and not only form lodging places for food, but cause some serious malocclusion. * * * Distal occlusion of the lower arch on one or both sides; bicuspids tipped distally, second molars mesially; rotation of one or more teeth; elongation of the teeth; separation with unsightly spaces, are some of the effects of extraction of the first molars. The results of extraction in general upon the form, position and function of the teeth are so well known that we ought to hesitate a long time before we ruthlessly destroy the harmony of the mechanism of articulation and mastication by the unnecessary extraction of any tooth."

Dr. E. Forberg (Stockholm) (9), shows from an examination of the teeth of 18,000 school children in Sweden, that the percentage of caries in the second molar, at the age of fourteen to fifteen, is greater than that of the first molar at the age of seven to eight, clinical experience also showing that after the twelfth year the first molar is less susceptible to caries, while the susceptibility of the second molar increases very largely; hence it is irrational to practice the extraction of a first molar in order that the second molar, which is a weaker tooth, should take its position. Dr. Forberg discusses the various arguments advanced in favor of the removal of the first molar, and

concludes that any gain in space is only temporary; that the occlusal curve of compensation is flattened, and the normal force of mastication reduced; while the backward development of the mandible does not occur. "Hence the extraction of the first molars not only reduces the force of mastication, but also disturbs the arrangement of the articulation and produces no favorable changes whatever."

At the April meeting of the New York Institute of Stomatology Dr. S. E. Davenport read a paper entitled "Stray Thoughts About Regulating." (10) He emphasized the importance of properly diagnosing each case, taking impressions and studying the casts, comparing with the patient's face before deciding upon the course to be pursued. He considered the desirability of avoiding extraction in nearly every instance. He said, "Without extraction we have, in the crowded arch, only to expand the arch and rearrange the teeth, while extraction makes the condition at once abnormal."

In a paper read before the Washtenaw County (Mich.) Dental Society (11), Dr. Milton T. Watson makes the claim that orthodontia is to-day as much a science as is the practice of surgery, one of the best evidences of this being the fact that both the normal and the pathological conditions of the parts involved are carefully considered, enabling the orthodontist to make a careful and accurate diagnosis and prognosis before beginning treatment, the facial requirements being as carefully considered as are the occlusal demands. Dr. Watson prophesies that the day will come when the study of fine art will occupy a prominent place in the dental curriculum. He says, "The artist or the sculptor would be an utter failure without a well developed sense of balance and harmony, and what applies so forcibly to a man who chisels a marble face has a vastly greater importance for the man who is molding the face of a human being through the immense possibilities in orthodontia."

[References—(1) Dental Clippings, Jan., '02, p. 45. (2) American Medicine, Feb. 15, '02 (from Items of Interest, June, 422). (3) International Dental Journal, June, '02, p. 393, 421. (4) Dental Cosmos, Oct., '01, p. 1227. (5) Dental Cosmos, March, '02, p. 286. (6) Western Dental Journal, July, '02, p. 292. (7) Dental Summary, March, '02, p. 155 (from Cosmos), 866. (8) Dominion Dental Journal, April, '02, p. 129. (9) L'Odontologie, April 15, '02 (from Cosmos, June), 645. (10) International Dental Journal, June, '02, p. 447. (11) Pacific Dental Gazette, May, '02, p. 308 (from Register).]

Digests.

INTRODUCTION TO THE STUDY OF IMMUNITY IN ITS RELATION TO THE DISEASES OF THE MOUTH AND TEETH. By W. D. Miller, D.D.S., M.D., Ph.D., Sc.D., Berlin. The methods of bacteriological investigation now in general use, which were introduced about the year 1870, made it possible in a comparatively short time to isolate a large number of different kinds of bacteria and to make a thorough study of them in regard to the conditions of development, physiology and pathology, not alone *in vitro*, but also in the animal body.

These studies soon definitely established the fact that different kinds of bacteria showed very marked differences with respect to their action on the animal body. The introduction of one kind into the animal system was seen to be followed by a more or less intense local or general reaction, while another kind, introduced in the same manner, caused no inconvenience to the animal whatever. Bacteria of the first kind were called pathogenic; those of the second kind, non-pathogenic. It must be remembered, however, that no sharp line of demarkation can be drawn between these two groups, since in point of virulence we observe a gradual gradation from bacteria such as the anthrax and tubercle bacilli, which, introduced into the human or animal body in very small numbers, or even singly, produce a fatal infection, to those which in enormous numbers do not bring about any disturbance whatever.

Relative Character of Susceptibility and Immunity. It was, however, not only possible to ascertain that different kinds of bacteria manifested a totally different action upon one and the same animal, but that different species of animals were quite differently affected by one and the same kind of bacterium. The cholera bacillus, for example, which is in a high degree pathogenic for the human body, does not under ordinary conditions have any effect at all upon the animal body. Guinea pigs do not suffer from the attacks of the typhus bacillus, nor are chickens and doves in any way affected by the bacilli of tetanus and anthrax, and most animals used in our laboratories are not affected by influenza, leprosy, etc.

An animal in which a particular kind of bacterium produces symptoms of disease is designated as susceptible; one which being inoculated with large numbers of a particular bacterium shows no reac-

tion is designated as insusceptible, immune or refractory. The conditions of immunity do not, however, represent a constant quantity. An animal which is normally immune toward a particular kind of bacterium may under certain conditions, such as protracted fasting, exposure to severe cold, bodily exhaustion, etc., become susceptible. For instance, the white rat, which is normally immune for the anthrax bacillus, becomes susceptible when made to run for hours on a treadmill until totally exhausted. Chickens which are immune to hog-cholera become susceptible if made to stand in cold water until the temperature of the body is perceptibly reduced, etc. From these facts we deduce the very important lesson that persons in a state of exhaustion should by all means avoid unnecessary exposure to infection.

Acquired Immunity. It was not long before the far more important discovery was made that it is not only possible to induce an artificial susceptibility, but an artificial insusceptibility as well, whereby animals or human beings normally susceptible to a certain disease are, by a definite preliminary treatment, made immune to the same. This discovery and the results which have already been worked out from it in the struggle against infectious diseases are to be numbered among the greatest victories which the human intellect has ever gained over inanimate forces.

Later on we will return to the question of immunity. At this point I wish only to emphasize one fundamental fact which forms the basis of our studies concerning immunity in its relation to diseases of the mouth and teeth. This fact may be expressed as follows: In the normal intravascular blood of every human being and animal there are substances (*alexins*) which to a certain degree afford protection against the invasion of pathogenic microorganisms. This protection, which is of a general nature, appears in the one case exceedingly feeble and easily overcome, while in other cases, particularly against certain kinds of bacteria, it is sufficiently powerful to guarantee absolute immunity under normal conditions.

Oral Immunity. Various well-known phenomena observed in the human mouth have led to the suggestion that here also protective substances similar to those found in the blood may be present. I call particular attention to the much-discussed fact that wounds in the mouth as a rule heal very readily and comparatively seldom give rise to severe infections; also to the equally suggestive fact that of two

individuals living under exactly the same conditions, the one may be absolutely free from caries, while the other shows excessive ravages in nearly all his teeth. I have referred the first-mentioned fact to the high degree of resistance which the tissues of the human mouth in a normal condition present to the ingress of infectious agents. Others account for it by the assumption that saliva possesses an antiseptic action, in support of which they refer to the habit that dogs have of licking their wounds, which is supposed to be the cause of their rapid healing.

The views of different authors regarding the antiseptic action of saliva, as well as the results obtained from their experiments, have heretofore frequently been diametrically opposed to each other. Florian (*Gaz. méd. de Paris,* 1889, p. 317) attributes a direct though weak antiseptic power to saliva; likewise Sanarelli (*Centralbl. f. Bact. u. Parasitenkunde,* Bd. x, p. 818); whereas Triolo (*Riv. d' Igiene e di Med. Prat.,* an. 2, No. 12) found that filtered saliva, such as was used by Sanarelli, possesses very slight antiseptic action. Also Hugenschmidt (*Cosmos,* 1896, p. 797), whose investigations were most carefully carried out under Metchnikoff at Paris, came to the conclusion that the antiseptic action of saliva is most problematical, and that the immunity of the buccal tissues to infection cannot be attributed to such action. Poppert (*Med. Woch'ft,* 1893, p. 833) goes still farther in claiming that the high mortality resulting from the extirpation of the larynx is to be accounted for by the fact that saliva and mucus from the mouth coming in contact with the wound bring about a decomposition whereby the most favorable conditions for the causation of pneumonia are created.

Influence of the Saliva. On account of this diversity of opinion it seemed to me desirable that the question of the antiseptic action of saliva be again subjected to a thorough study, in order finally to bring about a definite solution. The question, besides being one of great general interest, demands especial attention in reference to the treatment of certain diseased conditions of the teeth. It is a well-known fact that, apart from the many local diseases of the mouth and teeth and their various sequences, the oral cavity serves as the port of entry for the bacteria of a long list of the most fatal diseases to which the body is subject. I need refer only to tuberculosis, pneumonia, cholera, typhus, etc. It consequently becomes a question of the greatest importance whether these infection-bearers are allowed to pass

unchallenged through the mouth, or even make use of it as a point where they concentrate in sufficient numbers to carry out their attacks upon the body, or whether they come there to give battle to an equally subtle foe in which they may be totally destroyed or so far weakened that the danger for the time being is arrested.

Again, we have adopted the rule that in every attempt at the conservative treatment of an exposed pulp and in the treatment of root-canals it is absolutely necessary to exclude the saliva in order to prevent an infection or renewed infection of the tissues upon which we are operating. If, however, it should be proved that saliva possesses an antiseptic action, would it not be more rational to flood the pulp or root-canal with it in order to bring about the desired disinfection? We certainly have in the whole dental pharmacopeia no antiseptic more devoid of irritating properties.

Factors of the Problem. The solution of the question of the antiseptic action of saliva forms the first step, but only the first step, of the ladder which leads to a complete understanding of the subject of immunity in its relation to the tissues of the mouth and teeth. A large number of questions come up one after another for solution—some of which I have in the present communication attempted to treat more fully, others only to touch upon. These questions are—(I) Does the human saliva possess properties which are capable of preventing or retarding the development of bacteria or processes of fermentation in the human mouth? (II) Does the presence of potassium sulfocyanid in the saliva contribute to its supposed antiseptic action? (III) Is any protective action to be attributed to the oral mucus? (IV) Do the bactericidal properties of saliva exist in a more marked degree in persons immune to caries than in those highly susceptible? (V) Does fresh saliva contain bactericidal substances analogous to the alexins of the blood, which become inert on standing? (VI) Does saliva possess globulicidal or hemolytic properties? (VII) What part do autopurification and the struggle for existence play in the human mouth? (VIII) Do the mixed oral secretions have a bactericidal action upon pathogenic bacteria? (IX) What part does phagocytosis play in the mouth? (X) Do the bacteritic membranes on the teeth afford a protection against or do they facilitate the process of caries, or are they indifferent to it? (XI) How is the frequency of caries influenced by the reaction of the saliva? (XII) Do the teeth themselves show differences in

structure or composition which afford an explanation of the marked difference in their susceptibility to caries in different mouths? (XIII) Are there conditions of immunity present in the tissues of the human mouth which bring about a state of local immunity varying in degree in different persons and under different circumstances? (XIV) Does the saliva possess antitoxic properties?

Bactericidal Property of the Saliva. My experiments were accordingly directed in the first instance toward the solution of—QUESTION I—*To what extent does saliva, by means of its bactericidal properties, put a check upon the development of bacteria and upon processes of fermentation in the human mouth?* No reference is had here to the action of saliva upon pathogenic bacteria, this point being dealt with separately under Question VIII.

When we wish to determine the possible antiseptic action of any substance in solution we must first make sure that the solution does not contain, besides the one to be tested, any other substance which might in any way exert a retarding influence upon the development of bacteria. Furthermore, the solution must contain a sufficient amount of nutriment, and must be kept under such conditions of temperature as are most favorable to the development of the bacterium used in the test.

Sufficient attention has not been paid to these demands in the experiments relating to the antiseptic action of saliva. In particular, solutions have been used containing so very little organic substance that from this reason alone the development of many bacteria might be seriously interfered with. Sanarelli, whose experiments were for many years considered conclusive, filtered the saliva through a Chamberland filter, by which it was deprived of by far the greater part of nutrient matter, it containing after filtering but a small fraction of the amount of organic matter we are accustomed to add to our culture media; and when consequently particularly sensitive bacteria refused to grow in this solution, that fact cannot be regarded as a proof of its antiseptic action.

It is furthermore well known that bacteria as a rule require some time to accustom themselves to new surroundings, and when we transfer them, for example, from bouillon to a medium of such different osmotic properties as filtered saliva, many of them die simply as a result of the change, irrespective of any antiseptic property of the solution. If we were to test the antiseptic action of filtered

water we would arrive at results quite as unfavorable as those which Sanarelli obtained for filtered saliva. We are consequently not entitled to draw any conclusion whatever from his experiments until we have excluded the sources of error above mentioned.

We may put it down as a rule that our experiments must be carried out with such media and under such conditions as admit of a rapid growth of the bacterium used in the test. We have, then, to determine whether the addition of saliva to our medium prevents or retards the development of the bacterium.

Antiseptic Value of Germ-free Saliva. Experiments: First series —the saliva being passed through a Chamberland filter. My first experiments were designed to test the accuracy of the results obtained particularly by Sanarelli with saliva filtered through porcelain. In accordance with the principles stated I prepared a solution of bouillon from beef-extract, peptone and sugar, of double the customary strength, and filled a number of test tubes with 5 c.cm. To three of these test tubes I added an equal amount of filtered saliva of A, who is immune to caries. To the same number I added saliva of B, and finally, as controls, to an equal number I added sterile water. The saliva having been passed through a Chamberland filter was consequently free from bacteria and exceedingly poor in organic substances, so that by its addition, as well as by that of the water, the bouillon was reduced to the concentration ordinarily used in culture media. Finally the tubes were inoculated with a bacterium obtained from decaying dentin. If now the saliva contained any bactericidal properties, we must expect the development of the bacteria in the tubes to which it had been added to be retarded, compared to that in the solutions which were diluted with water, and especially we should expect to find a marked retarding influence on the part of the saliva of A. These expectations were, however, not fulfilled, the cloudiness appearing in the tubes containing saliva quite as soon as in the others. This experiment was repeated a number of times and invariably with the same result. I was not able to determine any retarding influence whatever on the part of the saliva.

Three different methods were made use of for determining whether the number of bacteria in any solution was on the increase or decrease, and also for comparing the rapidity of growth of bacteria in the different media. In cultures made in perfectly transparent media their subsequent clouding served as an index as to the

rapidity of development of bacteria. If, for example, we inoculate a solution of bouillon, and after thorough shaking divide it into two equal parts, and add to the one a given antiseptic, we will find that this becomes cloudy later than the others. The time which elapses between the appearance of the cloudiness in the two solutions may at once furnish a certain index as to the strength of the antiseptic added—and of course if the antiseptic is sufficiently strong the solution will remain clear indefinitely. Only a limited use was made of this method.

Rate of Acid Production. A second method consisted in determining the quantity of acid produced in the culture in a given time. In questions relating to the origin and course of dental caries we have to deal not so much with the numbers of the bacteria as with their potency or capacity for bringing about processes for fermentation. For this we have a measure in the quantity which they form in a given time. This determination may be very easily made by counting the number of drops of a five per cent solution of bicarbonate of soda necessary to neutralize the contents of the separate culture tubes. The drops from a pipet, regulated by a stopcock, were absolutely equal in size and counted 49 to 3 c.cm.

The third method which I employed is the one most commonly used, and consists in determining from time to time the number or comparative number of bacteria actually present in the cultures. For example: If we inoculate a given solution with a certain bacterium and wish to determine its rate of increase or decrease, we transfer at once a minute drop of the solution (on a loop of platinum wire) to a tube of nutrient agar, which has been melted and cooled down to about 50° C., and then pour the agar into the culture dish in the usual manner. We repeat this procedure at certain intervals, say after one, two, four, ten, twenty-four hours, etc. The number of colonies which subsequently appear in the agar cultures will tell how many bacteria there were in the corresponding loop of the solution.

Acid Production in Concentrated Solutions. In the experiments reported above the saliva was diluted with equal parts of bouillon and presented a 50 per cent solution only. In order to test the action of more concentrated solutions, I prepared a bouillon of fivefold strength, and added to one part of this four parts of saliva. By this means I obtained an 80 per cent solution of saliva in culture bouillon.

In the control tubes one part of the bouillon was diluted with four parts of water. The first experiment with 80 per cent solutions with the saliva of C, E, and F gave the following results. The numbers denote the number of drops of the alkaline solution required to neutralize the contents of the tubes, and correspond therefore to the relative amount of acid formed in the time specified:

	In 42 hours.	In 20 hours more.	Total.
C	9½	5½	15
E	9	7	16
F	10	7½	17½
Control	9	7	16

From these results we see that quite as much acid was formed in the tubes in which the bouillon was diluted with saliva as in those in which it was diluted with water; in other words, even 80 per cent solutions of saliva were powerless to exert a retarding influence on the process of fermentation.

Finally, by mixing 4.5 c.cm. of saliva with 0.5 c.cm. of a tenfold solution of culture bouillon I obtained 90 per cent solutions of saliva in bouillon, which were compared with solutions similarly diluted with water. On mixing filtered saliva with these tenfold solutions of bouillon a cloudiness sometimes appears, either immediately or soon after, which of course must not be confounded with the cloudiness produced by a growth of bacteria. I have frequently observed that saliva from one person causes the bouillon to become cloudy, while that of another leaves it perfectly clear, there being evidently some substance in the saliva of the one which was absent in that of the other; I did not, however, make any attempt to determine its nature. Where a cloudiness of this kind appears in the bouillon we must determine the rapidity of development of bacteria or their ferment activity either by making plate cultures from time to time or by measuring the amount of acid formed at certain intervals. In many of the subsequent experiments these intervals have been placed at twenty-four, forty-eight, seventy-two, etc., hours, and designated by I, II, and III.

In the first experiments with the 90 per cent solutions of saliva five tubes were prepared from the saliva of M, two from that of A,

two from that of H, and four control tubes. The following average result was obtained:

	I.	II.	Total.
A	7½	14	21½
H	8	14	22
M	9	13½	22½
Control	8¼	14½	22½

From these results we see that there is but a slight difference in the amount of acid produced in the bouillon diluted with saliva from that diluted with water. The saliva of M, who is almost free from caries, showed even a somewhat stronger fermentation than that of H, who is highly susceptible. The saliva of the immune A shows in this, as in many other experiments, a somewhat slighter ferment activity than that of the others. In some experiments the difference is still more pronounced, whereas in others, as we shall see farther on, there is no difference whatever. On the whole this difference is far too insignificant to be looked upon as an explanation of the cause of A's immunity.

Activity of Undiluted Saliva. In order to test the activity of undiluted saliva I found it necessary to adopt another method, which at the same time simplifies the operation considerably. Instead of filtering and then adding the necessary nutrient substances, these were added in dry form before filtering. For example, to 30 c.cm. of saliva I added 0.67 gm. of grape sugar and 0.67 gm. of peptone; this gives a 2 per cent sugar-peptone solution in saliva, which may then be filtered through the Chamberland filter and freed from bacteria; 30 c.cm. of water, with the above-mentioned quantity of peptone and sugar, were also filtered in the same way and gave the same solutions without saliva for the control experiments. A solution prepared in this way from the saliva of A and infected with Bac. prodigiosus showed a more active fermentation than the control solution, just double the amount of acid being produced.

In order to put the bactericidal properties of the saliva to a further test, I filtered a quantity of the saliva of B and C, and infected 5 c.cm. of it with Bac. prodigiosus. As control I infected 5 c.cm. of hydrant water which had been passed through the same filter. In twenty-four hours the saliva was much more cloudy than the water, and plate cultures showed that it contained three times as many bacteria. At the end of a week the number of bacteria in the saliva

was four and two-thirds times as great as that in the water. Accordingly Bac. prodigiosus finds more favorable conditions for development in a nutrient bouillon made from saliva than in one similarly made with water, and also a more favorable medium in saliva alone than in water alone. This experiment was repeated three times, and always with a similar result.

An experiment with my own saliva gave the following results: Number of germs in one loop of saliva at the beginning of the experiment, 52; after ½hr., 63; 2 hrs., 74; 24 hrs., 12,500. The same experiment made with sterilized water gave, as corresponding results, 64, 75, 46, 42. We see therefore that while the number of bacteria in the saliva rapidly increased, it diminished in the water. This certainly does not say very much for the antiseptic action of saliva. The decrease in the number of bacteria in the water is of course not due to its antiseptic action, but simply to the fact that water does not contain sufficient nourishment.

In order to emphasize the action of any antiseptic which may possibly be in saliva in a very diluted form, I filtered the saliva, after adding 1 per cent of peptone and sugar, through a Chamberland filter, and reduced it over the water-bath to half its volume. I then inoculated this condensed saliva with a caries bacterium, inoculating at the same time a 2 per cent aqueous solution of peptone and sugar in the same way as control. In each case there were three tubes. The average amount of acid produced during the first, second, and third days was as follows:

	I.	II.	III.	Total.
Bouillon of condensed saliva	5½	8	2¾	16¼
Water bouillon	5½	8	1	14½

From this experiment we see that even condensed filtered saliva does not exert any retarding influence upon the process of fermentation in comparison with water.

Non-filtered Saliva and Saliva Filtered through Paper. There is a possibility, and in fact a probability, that in passing saliva through a porcelain filter certain sensitive bactericidal substances which it might be supposed to contain would partly or totally lose their power. We therefore recognize the necessity of making control experiments with non-filtered saliva. Here, however, the great difficulty arises

of obtaining saliva free from bacteria, since it may be considered absolutely impossible to completely sterilize the human mouth, though an approximate sterilization might possibly be accomplished in edentulous mouths. The task of obtaining a sufficient quantity of saliva for purposes of experimentation direct from the glands and free from bacteria also meets with great difficulty. We are able, however, to overcome these difficulties by experimenting with bacteria which develop rapidly at room temperature. We know that if we make a plate culture from human saliva and keep it at ordinary room temperature, we will find as a rule after two or three days that nothing whatever has developed. It is consequently only necessary to filter the saliva through ordinary filter paper, which does not change its constitution while it frees it from by far the greater majority of bacteria which it normally contains, and then to infect it with some bacterium which grows well at room temperature, *e. g.*, with Bac. prodigiosus. If we keep the saliva thus infected at room temperatures and make plate cultures of it from time to time which are likewise so kept, and in which consequently only the bacterium which we have inoculated develops, we are enabled to carry on the experiment without disturbance on the part of the bacteria normally present in saliva. From the number of colonies which appear in the different cultures after two days we can readily see whether the bacilli introduced into the saliva are on the increase or decrease.

EXPERIMENT I. Number of bacteria: At first, 2,100; after ½ hr., 2,640; 1 hr., 3,600; 2 hrs., 1,956; 3 hrs., 2,820; 4 hrs., 1,920; 26 hrs., innumerable.

The second experiment, in which a small quantity of peptone and sugar was added to the saliva before filtering, gave the following results:

II. Number of bacteria: At first, 2,040; after ½ hr., 2,400; 1 hr., 1,956; 2 hrs., 2,280; 3 hrs., 2,040; 4 hrs., 2,340; 26 hrs., innumerable.

III. Saliva of an edentulous woman: At first, 28; after ½ hr., 80; 24 hrs., 156; 48 hrs., 14,600.

IV. Saliva of one immune to caries: At first, 357; after 1¼ hrs., 580; 4 hrs., 678; 24 hrs., 72,000.

V. At first, 110; after ½ hr., 148; 1 hr., 165; 2 hrs., 123; 2½ hrs., 162; 24 hrs., 5,400.

VI. At first, 118; after ½ hr., 121; 1 hr., 215; 2 hrs., 123; 2½ hrs., 121; 24 hrs., 5200.

VII. At first, 5; after ½ hr., 8; 5½ hrs.,., 13; 24 hrs., 146.

VIII. Saliva of an immune: At first, 59; after ½ hr., 76; 1½ hrs., 76; 24 hrs., 3,600.

IX. At first, 45; after 1¼ hrs., 72; 2½ hrs., 21; 24 hrs., 32,000.

X. At first, 107; after 1¼ hrs., 105; 2½ hrs., 16; 24 hrs., 12,000.

Saliva Not Germicidal for Extraoral Bacteria. From these results it appears very plain that saliva has not the power to prevent the development of a microorganism which does not normally inhabit the mouth. The oscillations which appear in some of the experiments may be accounted for by the fact that the bacteria are not always distributed equally in the saliva, and that especially the quantity of liquid which is carried by a platinum loop, even when taking the greatest precaution, is subject to considerable variations The falling off in the numbers of *some* of the experiments (especially IX and X) about the second hour might be used as an argument for the supposition that the saliva contains some antiseptic principle which it loses on standing. For reasons given below, and especially under question V, I doubt this, but shall not pronounce finally upon it till after further experiments.

The idea that human saliva may have an antiseptic action in respect to the bacteria habitually found in the mouth itself seems to me utterly untenable. It is about as reasonable as it would be to constantly reiterate the assertion that grass is a poison for cattle knowing at the same time that cattle flourish exceedingly well in a good meadow. We know that a considerable number of bacteria which we may designate as the oral flora are constantly found in the human mouth. As often as they are removed mechanically, by brushing or in the process of mastication, they rapidly form again and there is no doubt that they find a very favorable culture medium in the fluids of the mouth. Notwithstanding the knowledge of these facts there are many who still maintain that those fluids are poison for such bacteria.

Experimental Proof. It seems almost superfluous to approach this question experimentally, since we can *a priori* with the greatest certainty exclude any possible antiseptic action of saliva in respect to the normal oral flora. I have nevertheless made a few experi-

ments in which the saliva with or without the addition of sugar and peptone was passed through a paper filter and then put in the incubator. From the results here appended it may be seen that the bacteria increased in number from hour to hour.

EXPERIMENT I. On addition of peptone and sugar. Number of bacteria: At beginning, 2,640; after ½ hr., 2,520; 1 hr., 4,800; 2 hrs., 3,000; 3 hrs., 10,800.

II. Without such addition: At beginning, 2400; after ½ hr., 2520; 1 hr., 2000; 2 hrs., 2196; 3 hrs., 4080; 20 hrs., 10,600.

III. At beginning, 48; after 1¼ hrs., 29; 2¼ hrs., 28; 18 hrs., 36,000; 24 hrs., 67,000.

IV. At beginning, 510; after 1¾ hrs., 1,050; 23 hrs., 5,300.

In these as in all other experiments in which mouth bacteria are transferred to new media or are brought under changed conditions, we often find a diminution in the number of germs in the first hour or two. This diminution (aside from the oscillations caused by irregularities in the size of the drops conveyed by a platinum loop) may be accounted for by the fact that the bacteria require a certain amount of time to accustom themselves to the changed conditions. For this reason a decrease in numbers may take place when bacteria are transferred from saliva to bouillon prepared from beef extract, peptone, and sugar, as is evidenced by the following experimental results. The decrease in this instance is not due to any antiseptic action:

Number of bacteria: At beginning, 2,100; after ½ hr., 2,200; 1½ hrs., 1,800; 5 hrs., 20,800.

It is not to be wondered at that the bacteria of the mouth require a certain time to accustom themselves to changed conditions, since many of them do not bear transplantation under any circumstances, or at least all attempts to secure growths on artificial media have failed up to the present.

Here, again, as in the experiments recorded above with filtered saliva, I tested the effect of its condensation upon the supposed antiseptic properties of non-filtered saliva. I reduced the saliva of the relatively immune E and the highly susceptible C, H, and K to half their volumes over the water-bath, but restored that of C, H, and K to its original volume by the addition of sterilized water. I was then able, after adding peptone and sugar, to compare the condensed saliva of the immune E with the similarly treated but not con-

densed saliva of the extremely susceptible persons, C, H, and K. I obtained the following average results:

	I.	II.	Total.
E (condensed)	10	8¾	18¾
C	7½	8¾	16¼
H	9	9	18
K	10	5	15

Accordingly the saliva of E, from which we might have expected an antiseptic action, showed even in concentrated form a somewhat greater ferment activity than that of C, H, and K.

Elimination of Heat Factor. The objection may be made to this experiment that certain sensitive antiseptic substances in the saliva may have been destroyed by the heat to which it is subjected over the water-bath. In order to free the experiment from this perfectly just objection, I brought the saliva into a shallow glass vessel and allowed it to concentrate by evaporation in the incubator at the temperature of the human body; 30 c.cm. of the saliva of H and K together were in this way reduced to 5 c.cm. The fermentation of this sixfold saliva on addition of peptone and bread produced at intervals of twenty-four hours 10 and 8¾ units of acid; that is, the antiseptic substances contained in the saliva, even in six times their normal strength, permitted fermentation to go on in the ordinary manner.

Again, the saliva of C was reduced in the incubator to one-third its volume and was compared with the saliva of the same person which was kept in the incubator for the same time in a stoppered bottle, *i. e.*, subjected to the same conditions without evaporation or condensation. The condensed saliva produced 16 and 20 units of acid, against 12 and 16 for the non-condensed. Accordingly, instead of the antiseptic action of saliva being increased by the condensation, we see quite the contrary result in this experiment. No objection can be offered to this experiment as far as it relates to the less sensitive antiseptic substances which may possibly be in the saliva. Should it, however, contain very sensitive bodies, such as alexins, then it is quite possible that the process of condensation, even at the temperature of the human body, might exert a deleterious influence upon them. We will return to this point under the fifth heading.

Comparative Study of Equine Saliva. The saliva of a horse compared with that of C gave the following results:

Horse's saliva with starch.

I.	II.	III.	IV.	9 days.	Total.
(1) 0	8	5	9	1	23
(2) 0	7	3	8	6	24
		C's saliva.			
11	12	11	16	4	54
		Horse's saliva with sugar.			
(1) 0	5	2	12	0	19
(2) 0	6	2	9	0	17
		C's saliva.			
11	12	11	14	0	48

The formation of acid is seen to be throughout much less in the case of equine than that of human saliva. It is particularly to be noted that in the first twenty-four hours no acid at all was produced, which is, however, to be accounted for by the fact that the saliva of the horse showed a strong alkaline reaction at the beginning of the experiment. In the present case I found that twelve drops of my 5 per cent solution of bicarbonate of soda were necessary to produce an equally strong alkalinity in 5 c.cm. of water. In reality, therefore, the total amount of acid produced, for instance, in the first experiment was not 0+8+5+9+1=23, but 12+8+5+9+1=35, only the 12 units of acid produced in the first twenty-four hours were neutralized by the alkalies normally present in the saliva of the horse. The above results indicate one of the reasons why caries appears so rarely in the teeth of horses compared with its occurrence in human teeth.

Influence of Potassium Sulfocyanid. QUESTION II—*Does the presence of potassium sulfocyanid in the saliva contribute to its supposed antiseptic action?* Having sought in vain for antiseptic properties in the saliva as a whole, it seems scarcely probable that we should be able to find them in any of its constituents. Nevertheless, it seems desirable that the tests should be made. Most of the inorganic constituents of the saliva, such as carbonate of potassium and sodium, the chlorids and phosphates of potassium, sodium, calcium, etc., are present in quantities so small that they do not exert any

retarding influence whatever on the development of bacteria. In the case of potassium sulfocyanid, however, the temptation is great to attribute to it an antiseptic action, just as it was formerly believed to be the cause of the toxic effects of the saliva.

Among others Florian (*Gaz. méd. de Paris,* 1889, p. 317), who found potassium sulfocyanid constantly in saliva in amounts ranging from 0.07 to 0.1 per thousand [these figures are quite inaccurate; the amount really varies from mere traces (say 0.001) to 0.125 per thousand], writes of it as follows: "A une dose aussi faible il ne peut détruire tous les microbes qui pénétrent dans la cavité buccale, mais il est capable d'en arrêter le développement et son action sur certain d'entre eux peut être plus complète."

Chouppe (1888) made the observation that plants watered exclusively with saliva began to wilt as soon as the earth had become completely saturated, and died soon afterward.

Michel (*Deutsche Monatsschr. f. Zahnheilk.,* 1901, p. 157) also considers potassium sulfocyanid as a natural protection against caries; while Hugenschmidt (*Cosmos,* October, 1896) designates its antiseptic action in saliva as exceedingly weak, if not utterly wanting.

In view of these conflicting opinions relating to the antiseptic action of the sulfocyanid, it became necessary to again subject the question to the test of experiment. My tests were made in the first place in the customary manner, the substance being added to bouillon cultures of a caries bacterium in concentrations varying from 1:1000 to 1: 8000. In this concentration it did not show the slightest retarding influence upon the development of the cultures and I was obliged to use much stronger concentrations in order to produce a decided influence. I have observed a fair development of bacteria even in 4 per cent solutions of potassium sulfocyanid in bouillon. In view of these results the possibility of its having any antiseptic action whatever in the mouth where its greatest concentration does not exceed 1: 8000 seemed absolutely excluded.

Here, however, the question arises whether this substance may not produce effects in combination with saliva which do not manifest themselves in solutions of bouillon. In order to test the action of the sulfocyanid in its natural solvent, the saliva, I added it direct to the saliva in such quantity as to produce concentrations varying from 1: 5000 to 1: 250 (this in addition to the amount normally

present). To each tube I then added 0.1 gm. of peptone and 0.1 gm. of grape sugar or pulverized bread. Tubes prepared in this way, along with the control tubes to which no sulfocyanid was added, were placed in the incubator and were tested after twenty-four and forty-eight hours with respect to the amount of acid produced. The first group of experiments resulted as follows:

Amount of acid formed.

	I.	II.	Total.
Control tube	7	10	17
"	7	10	17
Sulfocyanid 1 : 2000	7	10	17
" "	7	10	17
" 1 : 1000	7	8	15
" "	7	8	15
" 1 : 500	5	7	13
" "	6	6	12
" 1 : 250	5	2	7
" "	4	6	10

Further experiments carried out in the same way gave results which were in part still less favorable for the sulfocyanid. In one case in which it had been added in proportion of 1 : 250 as much acid formed on the second day (*i. e.*, the fermentation was as intense) as in the control tube which contained no sulfocyanid. From these experiments we conclude that the presence of this substance in the saliva in the proportion of 1 : 1000 may have a slight retarding effect upon the development and activity of bacteria. Since, however, this percentage is eight times as high as the highest found in human saliva, we must regard these experiments also as negative in their results.

Sulfocyanid Not Antiseptic. Still further experiments of a somewhat different character were made, the results of which no less plainly speak against any protective action of the sulfocyanid. To the saliva of an immune which contained the highest percentage of the sulfocyanid I have ever observed (1 : 8000) I added still more in the proportion of 1 : 2000, so that the total percentage amounted to 1 : 1600. After adding peptone and sugar I filtered the saliva through paper and inoculated it with Bac. prodigiosus. The number

of germs in a loop of the saliva, kept at room temperature, was found to be as follows:

Number of bacteria: At the beginning, 285; after 1¼ hrs., 410; 1¾ hrs., 580; 4 hrs., 1,048; 24hrs., absolutely innumerable—computed at 1,000,000.

We see that Bac. prodigiosus had increased with enormous rapidity in the saliva, notwithstanding the fact that it contained five times as much sulfocyanid as is ever normally present. In fact, in a number of cases I observed that a more rapid development seemed to take place when a small amount of the substance was present in the saliva than without it.

The objection may be made to the above experiments which it is customary to make to all bacteriological experiments undertaken outside the living body, that the conditions do not correspond to those naturally present in the human mouth. It might well be supposed that living saliva in the mouth possesses properties which do not manifest themselves in the test tubes. Such suppositions are reasonable only so far as they relate to the process of phagocytosis, which, while it may be active under certain conditions in the mouth, must of course cease soon after the saliva is removed. On the other hand we know that those substances which impart bactericidal properties to normal human blood serum, as well as those which bring about artificial immunity, manifest their action just as strongly in the test tube, and sometimes even more strongly than in the living body. As far as the processes of fermentation in the human mouth are concerned, the conditions under which they take place so nearly approach those which may be produced artificially that an objection to the validity of the results can hardly be made on this score.

Experimental Test in the Living Mouth. In order, however, to determine whether processes of fermentation in the incubator in reality bring about different results from those which take place in the mouth, the following experiments were carried out:

In the upper denture of my own mouth one molar is wanting on either side. I constructed two plates in which the spaces caused by the loss of the teeth were filled out with rubber. In this rubber two holes were bored, the one on one side opening on the level with the morsal surface of the teeth, that on the other side opening toward the gums. The holes were about one-quarter of an inch deep and one-sixth of an inch in diameter. At 9:30 o'clock in the evening these

holes were filled with foodstuffs, and one of the plates put into my mouth and the other into the incubator (naturally in a moist chamber, to prevent drying by evaporation). The following morning at about 9:45 the contents of these holes were tested with reference to their reaction. The examination showed that the contents of the cavity opening free into the mouth had a less marked acid reaction than that of the corresponding cavity kept in the incubator—which of course is easily to be accounted for, since the presence of the plate caused a rather free flow of saliva, by which any acid formed must have been diluted. This was especially the case in the superficial layers, while at the bottom of the cavities the difference in the reaction was much less pronounced. The contents of the cavity opening toward the alveolar margin also showed superficially a slightly less pronounced acid reaction than that of the corresponding cavity in the incubator, while in the deeper parts no appreciable difference could be detected. A difference in the process of fermentation inside and outside the mouth exists accordingly only in so far as a dilution of the products of fermentation is brought about by the saliva. This difference will be marked enough in the superficial layers in the case of cavities opening free into the mouth, whereas in cavities to which the saliva does not have free access, especially in their deeper parts, the difference will be very slight or entirely wanting.

As a further experiment, little linen bags, about the size of a pea, were filled with foodstuffs and tied to my teeth on going to bed, while similar ones were suspended in flasks in the incubator. Here there was a marked difference, readily accounted for by the fact that the liquid contents of the bags were repeatedly forced out by the pressure of the cheeks and tongue.

QUESTION III—*Is any protective action to be attributed to the oral mucus?* Certain authors, as Triola, Wurtz, Lermoyez, etc., are of the opinion that the buccal and nasal mucus possesses an antiseptic action. Especially the two latter (*Comptes rend. de la Soc. de Biol.*, 1893, p. 756) observed that the anthrax bacillus lost its virulence after having been kept for some hours in contact with nasal mucus, and that other pathological bacteria (staphylococci, streptococci, etc.) showed a marked attenuation. Thomson and Hewleth (*Lancet*, 1897, p. 86), on the other hand, found that nasal mucus possesses a certain retarding influence upon the development of bacteria, but no bactericidal property. Klemperer also (*Münch. med. Woch'ft*, 1896,

p. 730) denies the bactericidal property of nasal mucus. Galippe (*Journ. des. Conn. méd.*, 1894, p. 124), referring to the frequency of infections on mucus-bearing surfaces, writes as follows: "This bactericidal property must act very intermittently when we take into consideration the many cases of blennorrhea metritis, etc. Everyone knows what accumulators of bacteria we have in the lacunæ of the tonsils, as well as the frightfully putrid smell of the conglomerations which form in them." It seems hardly probable that the buccal mucus in particular can contain any bactericidal property, in view of the fact that the mucous membrane of the mouth is invariably found to be coated with large masses of bacteria.

In the following experiments I have attempted to compare the possible antiseptic action of mucus with that of the saliva of the same person. I have in the course of my investigations repeatedly observed that if we allow saliva to stand in a test tube until the mucus and sediment have been deposited at the bottom of the glass, the clear saliva undergoes a less intense process of fermentation and forms a less amount of acid than that portion containing the sediment or mucus. In the latter case, however, the formation of acid stops and putrefaction begins sooner than in the former. These facts I have been able to explain only on the supposition that the saliva containing much sediment or mucus forms a better medium for the proliferation of bacteria than that free from them. If we pass saliva through a Chamberland filter it appears perfectly clear and thin; the mucus does not pass through except in very minute quantity, but remains in or upon the filter. If we collect this mucus and add to it about 2 per cent of sugar and peptone we find that in a certain period of time it will form more acid than will the clear unfiltered saliva of the same person.

The mucus collected on the filter after filtering 30 c.cm. of saliva produced in the first twenty-four hours 15, in the second, 17 units of acid, against 10 and 9 for normal saliva in the same periods. In a second experiment I obtained the results 10 and 17 against 9 and 14. These results, which show more intense fermentive action in saliva containing large quantities of mucus than in the saliva of the same person comparatively free from mucus, can certainly not be accounted for on the supposition that mucus possesses bactericidal or even retarding influence.

Putrefaction of Mucus. When Béchat affirms that mucus does

not readily putrefy, his view is not at all substantiated by my observations. If we allow a quantity of saliva to stand for half an hour in a test tube until the mucus has accumulated at the bottom, and then pour off the supernatant saliva into a second test tube, and put both in the incubator, we find after twenty-four hours that the tube containing the mucus emits a most intense smell of putrefaction and much stronger than that emitted by the tube containing the clear saliva. The buccal mucus even of a person immune to caries showed no bactericidal action upon B. prodigiosus. Immediately after inoculating the mucus with this bacterium it contained 277 bacilli per loop; in 1¼ hrs., 282; in 4 hrs., 274; in 24 hrs., over 6000; in 48 hrs., innumerable.

How far the oral fluids fall short of exerting a bactericidal action upon the normal oral flora may be demonstrated by anyone who will carry out the following experiment: In the morning before breakfast thoroughly cleanse the mouth and teeth with the tooth-brush and floss silk until every trace of food deposits, etc., has been removed. Then allow the teeth to go unbrushed for two or three days, limiting oneself as much as possible to the use of soft foods, in order that the mechanical cleansing of the teeth by mastication may be reduced to a minimum. One will be astonished at the rapidity with which the teeth become coated and at the immense masses of bacteria which will be found in the deposits upon them. Saliva is not only not able to keep a mouth which has already been thoroughly cleansed comparatively free from bacteria, but permits a very rapid reproduction of the oral flora after it has been mechanically removed. Even when during the time of the experiment only such foods are taken into the mouth as have been sterilized before using, that is, freed from living germs, the result will be the same. The large number of different kinds of bacteria which are constantly to be found in the human mouth also furnishes strong evidence against the bactericidal properties of saliva.

It is true that not all kinds of bacteria find the conditions necessary for their development in the oral cavity, but this is to be accounted for by various circumstances, among which the struggle for existence and self-destruction play a very important rôle. Notwithstanding this fact, we find in the mouth a richer flora than in any other part of the human body.

The Saliva of Carious Immunes. QUESTION IV—*Do the bacteri-*

cidal properties of the saliva exist in a more marked degree in persons immune to caries than in those highly susceptible? Having been forced to the conclusion that human saliva does not possess the power of preventing the development of bacteria under otherwise suitable conditions, or even of retarding it in any detectable degree, I next carried out a long series of experiments for the purpose of determining whether there is any difference in the intensity of processes of fermentation in the saliva of such persons as are immune to caries and that of those who are highly susceptible. In order to adapt the conditions of experiment as closely as possible to those present in the mouth, I proceeded as follows: A number of test tubes were each filled with 5 c.cm. of saliva of different persons, susceptible and immune, and to each 0.1 gm. peptone and 0.1 gm. grape sugar or pulverized bread added. The tubes were then put into the incubator and the amount of acid determined which was formed in the different tubes in equal periods of time. In the first place I compared the fermentation of the saliva of D and E, which was rich in potassium sulfocyanid, with that of F, which contained but a trace of that substance:

	I.	II.	Total.
D (av. of 2 exp.)	9	15½	24½
E " 2 "	8½	12½	21
F " 3 "	9½	14	23½

A comparison of the saliva of A, immune, with G, relatively immune and C, highly susceptible, gave the following results: -

	I.	II.	III.
A	7½	6½	2½
C	12¾	7¾	alkaline
G	10¼	4½	"

Here we find an appreciable difference in favor of A; his saliva was clear and formed but little sediment on standing; it contained accordingly comparatively little organic substance, which may in part account for the smaller amount of acid. The saliva of C and G was cloudy and formed a thick mucous sediment.

Further experiments were carried on with the following results:

	I.	II.	Total.
A	9	10½	19½
B	10	10	20
C	15	8 2-3	23 2-3

	I.	II.	Total.
A	9¼	7½	16¾
B	12½	6½	19
C	12½	9½	22

	I.	II.	Total.
A	8	11	19
B	8¼	12	20¼

Comparison between saliva of A and C with 2 per cent peptone and 2 per cent pulverized bread:

	I.	II.	Total.
A	7	14	21
C	12	11	23

Comparison between that of A, G, and H with 2 per cent peptone and bread, on the average:

	I.	II.	Total.
A	3½	8	11½
G	6	9 1-3	15 1-3
H	4¾	10½	15¼

Comparison between the saliva of the immune A and the highly susceptible O with 3 per cent peptone and grape sugar:

	I.	II.	Total.
A	12	12	24
"	12	11	23
O	12	11	23
"	12	10	22

	I.	II.	III.	Total.
D	9	15½	0	24½
E	8½	12½	8	29
F	9¾	15½	3	28¼

Between C and E with peptone and starch:

	I.	II.	III.	Total.
C	11	13	15	39
E	5	12	6	23

Between a mixture of the saliva of B and C, and H, with 3 per cent peptone and bread:

	I.	II.	III.	Total.
Mixture of B and C	10	20	5	35
H	8 1-3	17	8	33 1-3

Between E and the very susceptible L (poor in potassium sulfocyanid), 5 c.cm. of saliva with 0.1 gm. peptone and 0.1 gm. pulverized bread. Eight experiments with E and four with L, prolonged for 96 hrs.:

	I.	II.	III.	IV.
E	7	8	6	2
"	8	7	6	0
"	7	7	6	4
"	7	7	6	2
"	8	6	6	0
"	7	5	6	3
"	7	5	6	
"	7	5	6	
Average	7¼	6¼	6	2

	I.	II.	III.	IV.
L	7	7	7	4
"	6	7	5	5
"	6	6	6	0
"	6	6		1
Average	6¼	6½	6	2½

Comparison of the saliva of B with that of the highly susceptible N:

	I.	II.	III.
B	8¾	10	0
"	10	10	0
N	5	7½	7½
"	5	6½	3¾

Here we see that the saliva of the highly susceptible N forms much less acid than that of the relatively immune B.

Comparison between the saliva of P, with very badly decayed teeth, and the immune Q:

	I.	II.	III.	IV.
P sediment	14	13.	1	alkaline.
" clear	12	9	9	"
Q	8	8	10	"
"	8	10	9	"

Between A (immune), B (relatively susceptible), and R (edentulous):

	hrs.	I.	II.	III.
A sediment	5	11	13	0
" clear	2	10	11	16
B sediment	5	14	14	0
" clear	2	11	14	0
R	3	10	12	10

Results thus far Negative for Antiseptic Value of Saliva. Many other comparative experiments of this nature were carried out with the saliva of persons with little or no caries and those suffering very much from this disease. I was not, however, able to find in the saliva itself any factor which gave a satisfactory explanation of the immunity in one case and the susceptibility in the other. I have found, it is true, that saliva of immunes *as a rule* produces less acid by fermentation in a given time, especially in the first twenty-four hours, than the saliva of susceptible persons. The fact is brought out in experiments with the saliva of the immunes A and Q. The difference was, however, not constant, and I have sometimes found in the former case quite as high a degree of acid as in the latter, and in some cases, indeed, the saliva of a highly susceptible person has produced less acid than that of a comparatively immune (see comparison between B and N).

We have here a factor which should not be altogether overlooked, although it certainly is not of sufficient importance to account for the immunity in one case and the susceptibility in another. I am not quite prepared to state why the saliva of one person more readily undergoes fermentation than that of another, and shall reserve a further discussion of the question for a later occasion.

Naturally the reaction of the saliva at the beginning of the experiment, as well as the presence of certain salts, in particular carbonates, influences the amount of free acid appearing in the first twenty-four hours.

Defensive Proteids in the Saliva. QUESTION V—*Does the fresh saliva contain bactericidal substances analogous to the alexins of the blood, which become inert on standing?* We know that with very few exceptions pathological bacteria exert a deleterious influence upon the human body only through the medium of the poisons which they produce. These bacterial poisons possess a viru-

lence exceeding that of the most poisonous alkaloids (strychnin, tropin) produced by higher plants, and it is consequently an exceedingly subtle and dangerous weapon which bacteria make use of in their attacks upon the human or animal body. Fortunately, however, the human organism possesses equally subtle weapons which enable it to carry on the battle against the invading foe.

On the one hand the ameboid cells (lymphocytes and related cells) attack the bacteria, taking them up in very much the same manner as an ameba takes in small particles of nourishment and digests them—a process well known under the name of phagocytosis. On the other hand, the body protects itself either by producing a counter-poison which neutralizes the poison produced by the bacteria and so renders it innocuous, as in the case of diphtheria and tetanus, or by producing substances which have no action upon the bacterial poisons, but which destroy or weaken the bacteria themselves, *i. e.,* not antitoxic, but bactericidal substances, as is the case in cholera, typhus, etc.

We cannot here enter into a discussion of the question as to where these protective substances (alexins) are formed; suffice it to state that at the present time the view is almost universally accepted that they have their origin in the white blood-corpuscles and related cells, and do not find their way into the extra-cellular blood-current until these cells have suffered some injury which permits the alexins to escape. These protective substances are present in a weak form in normal blood serum, and their action is of a quite general nature, *i. e.,* directed against all kinds of bacteria. When, however, any pathogenic microorganism finds its way into the human body, that protective substance of the blood which performs the part of an antitoxin to the poison produced by the germ in question, or of an antibacteritic to the germ itself, increases to such an extent that the blood acquires a specific action, directed apparently only against the one bacterium or its products.

These protective substances appear in the secretions and excretions of the human body (milk, urine, etc.), but in much lower concentrations than in the blood itself. According to the investigations of Wassermann (*Zeitschr. f. Hygiene,* Bd. 18. 1894, p. 248), the immunizing power of milk in diphtheria and tetanus stands to that of the blood as 1 : 15 to 1 : 30.

Protective Substances May Exist in Saliva. It is now very nat-

ural to suppose that these protective substances may appear in very slight quantities also in the saliva, although so far as I am aware no experiments have been made to test the truth of this supposition. We have, however, in the East Indian snakecharmers a celebrated example of a case in which a protective substance seems to be present in the saliva. These snakecharmers treat snake-bites by the application of saliva to the wound, having previously acquired immunity by allowing themselves to be bitten at first by very small snakes and gradually by larger and larger ones, until they have accustomed themselves to the poison in pretty much the same manner as one accustoms oneself to nicotin, until they can subject themselves to the bite of the largest snake without suffering any deleterious effects. Apparently the antitoxin formed in the blood passes also into the saliva. In all probability, too, the saliva of persons suffering from diphtheria contains the diphtheria antitoxin; that of persons suffering from cholera a substance which exerts a bactericidal effect upon cholera bacilli, etc. We know that in the case of pneumonia a substance appears in the saliva which has a deleterious effect upon pneumococci, inasmuch as they lose their virulence during an attack of pneumonia, to regain it later. We cannot enter into a more critical study of this increased formation of specific protective substances, as their action is always one-sided and directed solely against the particular bacterium (or its poison) which is the cause of the infection.

We know, however, that the normal intra or extra-vascular blood serum of man and animals contains substances named alexins by Buchner, which possess bactericidal properties of a universal nature and not directed solely against one particular kind of bacterium as is the case in artificial immune sera. These substances exert their action not only in the living human and animal body, but, as first shown by Metchnikoff, *in vitro* as well. They have been the subject of most exhaustive studies which have added much to our knowledge of their nature and action, but have still left to be solved many problems regarding them.

Nature of the Alexins. The experiments of Metchnikoff, Bordet, Ehrlich, Wassermann, and hundreds of others have shown that these alexins are of a most complicated nature, that, in fact, we have to do with two different substances or components, one of which has been called "complement" (*cytase* of Metchnikoff), the other am-

bocepter *Immunkörper, Zwischenkörper* (*fixateur* or *substance sensibilisatrice* of the French authors). The first of these components, the complement, is of the nature of a ferment; it is destroyed by exposure to a temperature of 55°-60° C. for half an hour and is on the whole very unstable and readily decomposed, blood serum losing its bactericidal power for the most part, or completely, inside of twenty-four hours on account of the decomposition of the complement.

The second component (ambocepter) is a more stable compound, and may be exposed to temperatures of 55° C. and above for some length of time without suffering any change. Its function consists in preparing the bacteria or other cellular elements for the action of the complement, or in forming the bridge, so to speak, by which the complement obtains access to the bacteria. The relation of this component to the protective action may be compared to that of B. aceticum to the acetic acid fermentation, which consists in transferring the oxygen of the air to the alcohol.

According to Ehrlich's conception, we have not only one but a large number of complements in normal blood serum, by which the fact may be accounted for that the bactericidal property of the blood is general in its nature and not directed against any one particular kind of bacterium. In artificial immunity the blood does not lose its general bactericidal properties, but one of the ambocepters, which possesses the properties of a specific antisubstance for the poison inoculated, increases to such an extent that the general action disappears in comparison with the specific.

It appeared to me *a priori* very doubtful if there were any substance in the human saliva which could be compared with the complement of the blood, since the saliva contains but few leucocytes, and since the various experiments above described have led to the conclusion that saliva does not possess any kind of bactericidal action.

Work of Hugenschmidt. Hugenschmidt is the only one, so far as I know, who has occupied himself experimentally with this question. In a series of experiments carried out in the laboratory of Metchnikoff, he found that saliva exposed for half an hour to a temperature of 60° C. seemed in some cases to possess a slight antiseptic action as compared with normal saliva—quite the contrary to what would have been the case if there had been a substance anal-

ogous to the complement present, as in this case the exposure would have destroyed the antiseptic action. If there were any substance or substances in the saliva analogous to the complements in the blood, which impart to it an antitoxic or bactericidal property, they would be destroyed, as already stated, by exposing the saliva for half an hour to a temperature of 55-60° C., and the saliva would consequently lose its antiseptic action. If we should then add to this heated (inactivated) saliva a few drops of fresh saliva it would thereby be reactivated, that is, regain its antiseptic action in virtue of the complement (ferment) contained in fresh saliva, and consequently we would expect to find that heated saliva to which a few drops of normal saliva had been added would possess the same bactericidal power as fresh saliva, and accordingly more than the heated saliva which had not been reactivated.

The Experimental Test for Alexins. In order to test this question experimentally, I filled three test tubes with equal quantities of saliva filtered through paper. The first tube was left unchanged, the second and third were kept for half an hour at a temperature of 55-60° C., and to the third three drops of fresh saliva were added. All three tubes were then infected with B. prodigiosus, and were tested from time to time as to the number of bacteria they contained, with the following resultes:

	Non-heated saliva.	Heated saliva.	Reactivated saliva.
At first	8	16	11
After 1 hour	13	28	15
After 2¼ hours	21	12	16
After 23 hours	690	159	488

We see that in the normal saliva, as well as in the reactivated, a gradual increase in the number of bacteria has taken place. In the heated saliva, in which the complement, if any were present, and consequently the antiseptic action, would have been destroyed, a less rapid development took place, a result which, like that obtained by Hugenschmidt, is just the contrary to that which we should find in experiments on the blood or any other substance actually containing protective substances of the nature of complements.

We accordingly searched everywhere in vain for any property in the saliva which might be designated as bactericidal and which

could furnish us with an explanation of the relative immunity of the organs of the mouth.

We must not, however, overlook the fact that, although all of the experiments recorded above point to the conclusion that saliva does not possess bactericidal properties, the possibility is thereby not excluded that it may possess antitoxic properties—that is, that it may be able to neutralize toxic substances formed in the mouth and render them innocuous. Wehrmann (*Ann. de l'Institut Pasteur*, 1897, t. xii, p. 510) found that the ptyalin of human saliva mixed with a quantity of snake-poison which would otherwise prove fatal in a very short time, rendered it completely harmless. It is barely possible that the habit, widespread even among civilized peoples, of moistening the bites of insects with saliva may have a logical foundation in this property of saliva for rendering toxic substances innocuous. I shall return to this point, however, on a subsequent occasion.

A discussion of question VI is reserved for a future communication.

The Biological Factor. QUESTION VII—*What part does the struggle for existence play in the human mouth?* In all cavities of the human body which are lined with a mucous membrane a process of autopurification, a self-cleansing, seems to take place which in the one case is very pronounced and in the other scarcely detectable. This process has been most thoroughly examined in the case of the vagina. The vagina of newly born girls is free from bacteria. Soon after birth, however, a number of different kinds, which we may call the normal vaginal flora, establish themselves. Among these the bacillus of Doederlein seems to be the most important. If we introduce various species of bacteria into the vagina before the normal flora has been established they are found to perpetuate themselves for some length of time. If, however, they are not introduced until after the normal flora has established itself they diminish very rapidly and soon disappear altogether.

According to the investigations of Menge and Krönig (*Bacteriol. des weibl. Genital-canals*, Leipzig, 1897), of Doederlein, Stroganoff, Metchnikoff, etc., various factors act together in bringing about the autopurification of the vagina: (1) The acid reaction of the mucus which is favorable only to acidophile bacteria, to which group the vaginal flora belongs. (2) The accumulation of leucocytes which takes up many of the bacteria introduced and destroys them. (3)

The mechanical expulsion which probably performs a very considerable rôle. Chiefly, however, (4) the vagina is indebted for its autopurification to the acidophile bacteria, its normal flora, which prevent the proliferation of other kinds of bacteria—by which Menge explains the fact that staphylococci introduced into the vagina did not begin to disappear until the normal flora had been established.

In the case of mares, of which the vaginal secretion is alkaline, Cahanescu attributes the autopurification chiefly to the intense phagocytosis; the secretion showed no bactericidal properties whatever. In the case of bitches, female rabbits, guinea-pigs, etc., the autopurification takes place but slowly and imperfectly.

The autopurification of the nasal cavity is brought about in part mechanically through the expulsion of the mucus, by which great numbers of bacteria are carried off—a process which is assisted by more or less pronounced phagocytosis. It is a disputed question whether the nasal mucus possesses bactericidal properties or not, as the experimental results obtained by different observers stand at variance with each other. The question as to the existence of the normal nasal flora and as to the part which it performs in keeping down the growth of other bacteria has unfortunately not yet received the attention which it deserves, and I am not able to produce any observations regarding it.

The self-cleansing process in the mouths of human beings, as well as of animals, is one which should greatly interest everyone. Here, in comparison with other cavities, a complication of considerable importance is presented by the presence of the organs of mastication, which furnish centers of retention and stagnation that materially hinder the process of cleansing. In a toothless mouth the autopurification goes on more perfectly.

Autopurification of the Oral Cavity. In the process of autopurification of the oral cavity the following factors come into consideration: (1) The mechanical action of mastication. At every meal, unless restricted to very soft food, deposits and precipitates containing millions of bacteria are rubbed off the teeth and mucous membrane and passed on into the stomach. The importance of this factor appears very clearly in cases where a person for some cause or other has restricted mastication to one side of the mouth; how quickly unused teeth become coated with deposits is very well known

to every dentist. The thoroughness of the mechanical self-cleansing depends to a certain extent upon the form and position of the teeth and particularly upon the physical properties of the food. We find that even the teeth of dogs appear dirty whenever, as is frequently the case with lap-dogs, they become loosened by pyorrhea and can no longer be used for mastication. (2) The saliva exerts a certain amount of influence in dissolving soluble substances and carrying them off along with bacteria and fine particles of food, as well as in diluting to a certain extent products of fermentation which are injurious to the teeth. (3) Phagocytosis does not appear to perform a very important function under ordinary circumstances. This question, however, will receive the consideration which it merits in a later communication. (4) Bactericidal properties of the saliva, which might come into play in the process of cleansing, are not present in sufficient strength to be detected by any of the methods above employed. The question deserving very close study is that (5) of the part which the struggle for existence plays in restricting the growth of bacteria in the mouth. With a view of determining the action of this factor, the following experiments were undertaken:

Two test tubes were filled each with 5 c.cm. of fresh saliva, and to one of them 2 per cent of grape sugar and peptone were added. Both tubes were then infected with B. prodigiosus, and after the saliva was well shaken the number of this bacillus per loop of saliva was determined by the ordinary method. The tubes were kept in the incubator and the number of prodigiosus bacilli which they contained was again determined in ½, 1¼, 24, and 48 hrs., with the following results:

	Saliva without sugar.	With sugar.
Bacteria at beginning	20	337
" after ½ hour	24	350
" " 1¼ hours	25	286
" " 24 "	76	0
" " 48 "	39	0

We see that the number in the tube containing peptone and sugar very rapidly decreased, so that after twenty-four hours they had entirely disappeared. In the saliva which contained no peptone and sugar the bacilli were not so rapidly destroyed, although here also the development was exceedingly meager. We have already seen,

however, that saliva alone possesses no antiseptic action for B. prodigiosus, and that this bacterium develops very well at room temperature in a saliva filtered either through a Chamberland filter or only through paper; in such cultures we often find innumerable bacteria at the end of twenty-four hours.

B. prod. also develops very rapidly under normal conditions at the temperature of the human body, so that the only factor which can account for its destruction in the above experiments is the struggle for existence with the oral bacteria present in the saliva. That it is here really the struggle for existence by which B. prod. becomes eliminated seems to be proved by the fact that when the saliva is passed through filter paper, by which means by far the greater majority of the bacteria are removed, this bacillus is able to maintain itself for a greater length of time, as is seen in the following experiment, although here also it is finally destroyed:

Bacteria at beginning	298
" after 1¼ hours	231
" " 17 "	960
" " 24 "	620
" " 3 days	0

If added to saliva *in sufficient numbers* B. prod. is able to hold its own for some time even at the temperature of the body when sugar is not present. For example:

Bacteria at beginning	9,600
" after 22 hours	22,200
" " 48 "	12,000
" " 3 days	775
" " 4 "	13
" " 6 "	0

At room temperature, the oral bacteria being paralyzed by the cold, the prodigiosus increases with great rapidity. For example:

Bacteria at beginning	7,800
" after 22 hours	39,900
" " 48 "	600,000
" " 3 days	innumerable.
" " 4 "	"

The next experiment brings the struggle for existence still more clearly to view. I thoroughly rinsed my mouth with a bouillon cul-

ture of B. prodigiosus containing over 2,000,000,000 bacilli, forcing the liquid between the teeth in order to give the microorganisms a chance to establish themselves in "out-of-the-way places." Immeditely afterward and again at the end of 1, 2, 3, 6, and 18 hours, I determined the number of bacilli in a loop of my saliva. The following are the results:

Bacteria at beginning	97,600
" after 1 hour	1,220
" " 2 hours	127
" " 3 "	17
" " 6 "	0

Here we see an astonishingly rapid decrease of bacteria—at the end of the third hour only 17 per loop being left instead of 97,600—and it is reasonable to suppose that at the end of the fourth hour the prodigiosus had already completely disappeared from the mouth. The rinsing of the mouth with a culture of prodigiosus caused a slight flow of saliva which made it necessary for me to swallow or expectorate occasionally during the course of the experiment, which may have contributed somewhat to bring about such a rapid decrease in the number of bacteria. This, however, could not account for the total disappearance of the bacilli, since we know very well that by no amount of swallowing or spitting can we free the mouth from its germs.

Undoubtedly very many other bacteria which from time to time obtain access to the human mouth suffer the same fate as B. prodigiosus, in that they are driven to the wall in the struggle with the normal flora that are already established therein.

Influence of the Struggle for Existence upon Specific Pathogenic Bacteria in the Oral Cavity. It would be a matter of intense interest to determine in which manner and to what extent pathogenic bacteria, not normally inhabiting the mouth, such as the tubercle, cholera, typhus, and other bacilli, are influenced by the struggle for existence with the oral flora. Experiments carried out in the mouth with those bacteria are, however, so dangerous that up to the present I have not had the courage to undertake them, while results obtained from experiments on animals are not conclusive, since the saliva of animals varies very materially in composition from that of man. But, taking into consideration how widely the above-mentioned microorganisms, and particularly the carriers of tuberculosis

and syphilis, are distributed, we must infer that they frequently find entrance into the mouth, and that they must be very soon eliminated again, otherwise primary tuberculosis and syphilis of the mouth would be much more common than they are.

Description of the Persons Referred to in the Experiments on Saliva. "A." Dentist, thirty-five years of age, perfect general health, with slight tendency to pyorrhea alveolaris. Strong, yellowish teeth without a trace of caries, *i. e.*, immune. Saliva clear, thin, forms considerable sediment on standing. Reaction of saliva at 11 a. m. slightly acid to neutral. Potassium sulfocyanid = 0.0125 per cent.

"B." Professor of medicine, forty-nine years of age, in perfect organic health, but formerly a pronounced neurasthenic. Teeth of average structure and average tendency to decay. Reaction of parotid saliva acid, of sublingual alkaline; total reaction about neutral.

"C." Servant, thirty-nine years of age, teeth except lower incisors all decayed to the gums. Saliva exceedingly ropy, cloudy with varying quantities of sediment. Sulfocyanid = 0.003.

"D." Student of twenty years, in good health. The first four molars wanting, two of the remaining teeth carious, in one the pulp dead Sulfocyanid = 0.01.

"E." Student of nineteen years, in good health. Twelve decayed teeth, in five the pulp dead. Sulfocyanid = 0.01.

"F." Student. One tooth extracted, fourteen fillings (of these two root treatments) in upper jaw, one in lower. Sulfocyanid = 0.001.

"G." Physician, forty-three years of age. Comparatively free from caries, gouty diathesis. Sulfocyanid = 0.009.

"H," "I," "K." Orphan girls, eleven to thirteen years of age. Teeth neglected and in a general condition of ruin. Reaction: H, slightly acid; I and K neutral to alkaline.

"L." Nurse, nineteen years of age. Teeth nearly all more or less decayed. Saliva exceedingly foamy, neutral. Sulfocyanid = 0.003.

"M." Dentist, twenty-six years of age. Thirty-two teeth, with only two small fillings. Reaction neutral. Sulfocyanid = 0.003.

"N." Secretary, about forty years of age. Universal caries. Saliva transparent, ropy, but little sediment, neutral. Sulfocyanid = 0.003.

"O." Woman in her forty-second year, with eight children. Twen-

ty-three teeth, of which thirteen with extensive acute caries. Saliva exceedingly ropy, foamy, slightly alkaline.

"P." Servant girl, fifteen years of age. Teeth badly decayed. Saliva cloudy, moderately ropy. Reaction at 11 a. m. slightly acid. Sulfocyanid = 0.009.

"Q." Dentist (Chilean), thirty-five years of age. Strong, yellow teeth without a trace of caries. Saliva semi-transparent, slight sediment, thin. Sulfocyanid = 0.007 (?).

"R." Toothless woman, sixty years of age.

"S." Toothless woman, fifty-seven years of age. Lost most of her teeth in her twenties. Sulfocyanid = 0.002.

(But little importance is attached to the reaction of the saliva as given above, as it acquires significance only when taken repeatedly and at various hours of the day.)

The results recorded in this paper are given as little more than an introduction to a subject of vast extent and importance, to which I hope to be able to furnish further contributions in the future.—*Cosmos.*

PROPHYLACTIC ITEMS. By R. B. TULLER, D. D. S., CHICAGO.

Don't!

Don't what?

Don't be a lobster—if you can help it.

There are some things to Don't as well as some things to Do.

Don't be a clam!

Don't be a clam that shuts tight when you should open and tell your patients a lot of things they should know.

There are too many teeth being extracted.

Not so many now as there used to be by regular practitioners, but too many.

Fortunes have been made by making a business of extracting teeth.

Palatial residences have been built through the groans, shrieks and lamentations of women and children.

And even of strong men.

It is a crying shame!

There are few dentists to-day who do not know how to soothe an aching tooth.

And treat it so that it may be preserved to many years of usefulness.

But the people themselves are to blame.

There are some—a good many—intelligent people who have an idea that teeth should be preserved.

But there is still a larger class who let their teeth go until trouble overtakes them, and then run to the extractor.

Sometimes to the blacksmith.

It is strange how readily a lot of humanity will part with their teeth.

Some seem *anxious* to get rid of them, as though it were a matter of course that they must ultimately be lost—

And the sooner they get them out of their mouths and false ones in the sooner they will be at ease in the matter.

The trouble and inconvenience and insufficiency of mastication do not seem to have a thought with some people until it is impossible to repair the damage.

Store teeth will do, and they don't ache.

Plenty of people will lose a few teeth and then look after the remaining ones pretty well.

It is the deformities that come from the loss of one tooth, two or three teeth, that I want to talk about.

When I say deformities I mean nothing less.

Any practitioner of a few years has seen cases of malocclusion that amount to nothing less than deformity or disfigurement.

It does not follow in every case of the loss of a few teeth, but it does in many cases.

Don't you remember Mrs. So and So, who said, "Doctor, what is the matter with my upper front teeth? They used to be very perfect in alignment; now they are horribly irregular."

And when you examined you found the lower incisors were biting abnormally against the palatal shoulders or inclined planes of the upper ones, forcing some of them forward out of line.

You have found the lower teeth in some cases coming clear up to the gums behind the upper teeth.

Or with some people whose under jaw protruded you have seen the upper teeth entirely hidden by the lower teeth coming up outside.

The disfigurement is sometimes grotesque and you are forcibly reminded of bulldog protrusion.

These things come very often indeed from having had extractions of one or more teeth years before.

They are disfigurements that many wish to overcome.

But when we come to study the problem of remedy we find difficulties that require extensive and expensive prosthetic appliances very often.

Such malocclusion often calls for the highest skill and ingenuity to open the bite and not be called upon to build up almost every tooth in the head.

It often comes to the point where no remedy is possible, except by the extracting of other teeth, and often sound ones.

Sometimes it is of such a nature that it necessitates the clearing of one jaw or the other of its remaining natural teeth and inserting a full denture.

If you have been long in practice you have had some of these malocclusions grow right before you.

Possibly you took out the teeth years ago that caused it, but more likely it was the "other fellow."

Anyway, whether it was your work or not, it is possible that if you had comprehended just what was going on in the succeeding years, gradually, slowly changing, you could have prevented any marked change and averted the growing disfigurement.

It often happens that one single tooth is pushed out of place, and badly so.

It looks easy to remedy that defect, but it is often impossible to remedy it by simply substituting an artificial tooth for the offending one, since the malocclusion prevents.

Nothing can be done but readjust the bite, involving many teeth.

These disfigurements annoy women more than men usually, for it often spoils an otherwise handsome face.

But rarely do they trace the cause to that unfortunate tooth extraction.

And rarely does any one look ahead to what the results of that loss of one or two teeth may be twenty years away. It is up to you, Mr. Dentist, to tell them.

Why, a person should be as reluctant to lose a tooth as to lose a finger.

They won't notice the loss of the tooth so much at first, but we have just gone over what happens often in twenty years.

In the matter of mastication, one of the most important functions in the human economy, the deficient condition increases in a sort of geometrical or arithmetical progression as the teeth are lost.

One tooth isn't much, but two are. Three are mucher and four are much mucher, and so on. (Excuse my rhetoric.)

So don't be a clam when the importance of this matter is so great.

Open your shell—mouth, I mean—and talk. Talk to the father and the mother and the child and to any one and every one that doesn't value teeth as they should be valued.

The good Lord didn't exercise any more omnipotent skill and wisdom in making any other part of our economies than He bestowed upon a tooth.

It was made for a purpose—a good purpose, an important purpose, a wise purpose—and every one should remain in the jaw until nature—or pyorrhea—sheds them.

And knock pyorrhea out—or prevent it.

Preach the sermon of don't—don't extract.

Out in the country some fellows will ride around and look up people who are ready and willing to have teeth "pulled."

And because the fellow won't be around again soon ("mebby") they conclude to have several good ones taken out that are *liable* to ache—some time.

Or, since the fellow will put in store teeth for $8.00 (or $5.00 if he can't get $8.00), and charge nothing for extracting, they will submit to clearing the mouth in many cases.

"What's a tooth, anyway? If it hurts, yank 'er out."

What's a hobnail in your boot? If it gets sharp, bent and catching into things, yank 'er out.

One is about as important as the other—with some folks.

Say, I know a dentist who, long years ago, early in his practice, took out thirty-two teeth from one mouth in one sitting. Wow!

He did it under protest, but was sorry he hadn't positively refused before he had fairly begun.

The patient was a young married woman, possibly twenty-eight years old, wife of a farmer.

Some of the teeth were decayed, some aching. All were susceptible to repair and salvation.

The farmer came with his wife to make the bargain.

The dentist insisted that anyway those should be saved which were not aching.

The farmer said: "How much to fix 'em up, Doc?"

I said—I mean the dentist said—he couldn't see his way out for less than $50 or $60, as there were a number of the front teeth decayed and that meant gold of course.

"How much f'r the plates, Doc?"

"Twenty-five dollars, but——"

"And you'll do the pullin'?"

"O, I ought to get $10 at least for taking out thirty-two teeth, but that should never——"

"Come now," said the farmer. "You ain't a-going' to git no $50 or $60 out ov me—n'r forty neither. Not much! You go ahead and pull them teeth, all on 'em, and make two plates and you'll git y'r twenty-five dollars and no more. An' I can git it done over to C——ville f'r less'n that."

"But," protested the young dentist, "a lot of those teeth are not decayed at all. I can't take them out."

"Well, they will decay an' it'll be $50 f'r fillin' now and another forty or fifty later, and no set of teeth aint worth no hundred dollars. No, sir!"

The young wife fell in and repeated, "No, siree. No set of teeth is worth $100 and I'd begrudge half of that."

She said she had the grit necessary to take them all out.

The dentist wanted the $25 pretty badly, but he declined to "pull" the teeth—all of them. He tried to fix it up on a partial plate deal.

"No, you don't! Might just as well clean out the hull dum shootin' match while your at it and have done with it."

I—I mean the dentist—still hesitated and the farmer began to get impatient.

"Come, now, git to work," he said, "or I'll go across the hall to that other dentist."

That other dentist didn't need the $25 as much as this dentist did, and so with many a twinge of conscience—one at least with each tooth—the slaughter began.

A halt and an argument when the decayed ones were all gone. The dentist thought the woman would be ready to cry quits by that time.

"No, you don't," said the farmer. "You keep right on till you git

'em all. Don't want no second job. Lindy can stan' it, you bet! Say, Doc, she can do more work 'round the farm than a hired man. Go ahead."

Echo from wife: "Go ahead and git it done with."

At last the thirty-two teeth were all out. That dentist was nearly sick. Teeth to the right of him! Teeth to the left of him! None in front of him—nothing but a gory gap.

And the gory gap spoke—after discharging some gore.

"There! by ding! Dem deeth won't dever have to be bulled again!"

"No, you bet!" said the husband, "them pesky things won't never have to be pulled no more." And with a grin of satisfaction he added, "And they won't be no more skirmishin' around nights by me heatin' a flatiron an' huntin' up the camfire bottle. Say, Melin, when mine gits to troublin' me like yourn did I'll come down and have mine all out. But *mine* are putty good teeth."

Two people put in a pretty bad night that night—the dentist, who was haunted by nightmare and Colonel R. E. Morse, and the wife of the farmer, who nearly bled to death.

One person slept like a log until roused to get out and hitch up and go four miles for the doctor.

He had saved money on the job of dentistry—and it was a job—J-O-B—but when he settled the doctor's bill for about a month's attendance on his wife he began to see there wasn't so much in it. "But them gol-dinged teeth don't have to be pulled no more. That's done f'r good."

I—that is, the dentist—have prayed for forgiveness many a time. But the horrible memory sticks and Col. R. E. Morse never lets up. Young man—young practitioner, beware of the Colonel.

O, I don't mean the farmer; he wasn't haunted except with the cost. His name was Timothy Tightwad. "But them gol-dinged teeth," etc.

This story has a moral—a prophylactic moral—DON'T.

Don't be a lobster!

Don't be a clam!

DON'T BE A VANDAL!—*American.*

PYORRHEA ALVEOLARIS. By C. F. W. Bödecker, D.D.S., M.D.S., Berlin, Germany. Read before the American Dental Society of Europe. Like most of the authors who have written on this subject, I have to admit that this name is altogether descriptive of the pathological process in question. But when we consider terms like Riggs' disease, gingivitis expulsiva, cemento-periostitis, alveolitis infectiosa, phagedenic pericementitis, etc., etc., each expressing only one stage of the disease, we have to admit that the term pyorrhea alveolaris, especially as it has been adopted by the majority of the profession, is preferable.

On the etiology of the subject much has been said and published. I therefore deem it a waste of your valuable time to discuss all the different opinions of the authors found in our literature, which I doubt not are familiar to every one interested in the treatment of the disorder. I will therefore confine myself to a short statement, principally of my convictions about this disease, based upon the observations made in my practice, and then give a brief outline of my method of treatment, which has given me most satisfactory results.

Pyorrhea alveolaris is sometimes confounded with a number of other diseases of the gums, as well as with atrophy of the alveolar portion of the jaws. The latter not only occurs in aged patients but is sometimes met with early in life. Many authors believe that the cause of pyorrhea is local, others claim it to be entirely constitutional, while my observations lead me to believe that in most instances both factors play a part. I have always regarded this disease, at least in its incipient stage, as an expression of some systemic disorder of which the patients themselves have often no knowledge. In the same manner as an absolutely healthy system is almost immune from an attack of the bacteria of infectious diseases, so will a healthy pericementum and gum resist an infection of the pathogenic bacteria which are usually present in every mouth. When the vital forces of the system are much depressed the tissues of the body have less resistance, rendering them more favorable for the invasion and propagation of microörganisms. I therefore claim that as long as the system retains its normal vitality pyorrhea will not occur. The disease usually begins while the patient is suffering from some constitutional disturbance, as anemia, rheumatism, gout, influenza, diabetes, tuberculosis, syphilis, typhoid, chronic diseases of the nervous

system, the heart, the liver or the kidneys, etc. Sometimes it is the result of the administration of medicines, such as arsenious acid, phosphorus, the salt of mercury, iodin, bromin and lead, or it may develop from local causes, such as faulty articulation of the teeth, foreign bodies pressed under the gum, careless regulating or wedging, badly fitting partial dentures, clasps, bridges, crowns, filling materials left under the gum, improper use of the toothbrush, or anything that will irritate or injure the pericementum or even loosen the festoons of the gum from their attachment to the necks of the teeth. As another cause of the disease in question I would mention pregnancy, although when it arises from this it seldom needs much treatment except in a system of very low vitality.

In the incipient stage of pyorrhea, when the gums encircling the necks of the teeth lose their attachment, an invasion of microörganisms into the tissue occurs, and as the organism is not in a normal state of health a *chronic* suppurative inflammation is the result. If, on the contrary, the resistance of the body is normal, any injury to the gums or even the pericementum produces an *acute* inflammation which, after the foreign body has been removed, will result in healing by first intention or by *acute* suppuration. During inflammation the mucous membrane has a tendency to secrete an extra quantity of mucus. It is an acknowledged fact that lime salts are always deposited in a framework of mucus. This explains the formation of an excess of calculi whenever the gums become inflamed, and then we find these salts deposited upon the necks of the teeth as well as a certain distance under the gum. The formation of the so-called seruminal calculi, found at the middle and sometimes at the apical portions of the roots of teeth, can hardly be explained as resultant from the saliva and we have to admit their derival from the blood.

In some instances of pyorrhea we observe that the ends of roots of teeth which are quite loose are entirely covered with deposits, while at their middle portion we may find but little calculus. M. L. Rhein has extracted an upper molar on which the pericementum around the neck of the tooth was in a normal condition, while the tips of the roots were covered by deposits, apparently proving that these calculi were deposited in that place without an established communication with the oral cavity. I am in the habit of closely examining all the teeth I extract, but I have never seen such a specimen, and if seruminal calculi are deposited at the ends of the roots without a communi-

cation leading to the margins of the gum, it is not quite explicable why we do not meet with such specimens more frequently. In some cases of pyorrhea we find in the pockets under the gum very little or no calculary deposits. I have noticed this condition mostly in patients suffering from wasting diseases, such as tuberculosis, anemia, etc. In those instances there is usually present a white, sticky, soft, mucoid deposit, called sordes, or white tartar, in which an abundance of microörganisms is found. We also observe this deposit in all cases of pyorrhea under treatment, although the time of its formation varies according to the care the patient bestows upon his mouth. Sordes usually reforms in from six to ten days after the first removal of the calculi, as well as after every treatment. Its formation gradually decreases with the disappearance of the inflammatory process in the pericementum and gums. As the disease advances it reaches the periosteum of the alveolus, disturbing the nutrition of the bone, which thereby becomes necrotic.

Sometimes pyorrhea is accompanied by subperiosteal, so-called false abscesses which arise in the same manner as abscesses and furuncles in other parts of the body, i. e., by an infection. I have noticed these abscesses mostly in the mouths of patients suffering from great nervous strain or whose constitutions were much run down by chronic diseases. The abscesses usually make their appearance either on the lingual or the labial aspect of the alveolar process, starting in or beneath the periosteum. At first the inflammatory destruction is confined to the superficial portion of the alveolus; but when the abscess recurs, which it usually does, the alveolus becomes perforated and the inflammatory process extends into the pericementum, and later the cementum itself becomes involved. I always regard the prognosis of teeth affected with recurrent subperiosteal abscesses as doubtful. I have noticed that whenever these abscesses recur they cause, by an irritation of the myaline of the bone, an exuberant growth of granulation tissue (a granuloma), gradually absorbing the roots of the teeth. Against this condition, as is well known, we have been unable to find a remedy. I have frequently been successful in preserving such abscessed teeth, especially when I was first able to remove the pulps and fill the canal soon after the first attack of the abscess, but usually in recurring cases the roots are gradually absorbed and either drop out or they become painful and have to be removed. The granuloma made up of the so-called osteo-

clasts absorbs the bone as well as the cementum in the form of bay-like excavations, leaving pointed excrescences between the bays, which after the extraction of the tooth are visible to the naked eye. Upon examination we find that the end of the absorbed root is beset with innumerable delicate, sharp processes. These pointed excrescences cannot be removed, and consequently are a mechanical irritation to the neighboring tissues every time the tooth is pressed upon by its opponent. This irritation stimulates the further growth of the granuloma until the tooth is lost.

The secondary influences upon the pulps of the affected teeth are also at times serious. If the abscess recurs often or becomes chronic the pulp of the tooth soon reacts by a chronic hyperplastic pulpitis, or an atrophy of its nerves and blood vessels is the result. As these diseases are very painful they usually lead to the loss of the tooth unless we are able to extirpate the pulp at an early stage of the disease. When chronic hyperplastic pulpitis or an atrophy of the pulp has existed for some time the dentin usually becomes so sensitive that the mere touch of an instrument produces excruciating pain, making the removal of the pulp impossible. It seems to be the experience of most practitioners that teeth afflicted with an advanced stage of pyorrhea promise better results when their pulps have been extirpated and their canals filled, and this opinion I fully corroborate. Characteristic facts to be observed in the diagnosis of chronic hyperplastic pulpitis or in atrophy of the pulp are that the teeth become quite sensitive to thermal changes, especially to cold, while percussion and pressure then only give pain when directed to that portion of the root on which the subperiosteal abscess is situated. The color of the tooth remains normal, and unless very much loosened by the pyorrhea it is still tight in its socket.

In regard to the treatment of pyorrhea I will state that success depends mostly upon the ability of the operator. Any one who is able to detect and remove every particle of calculary deposit and necrotic tissue present will be successful in the treatment of the disease in question, although to become skillful much practice is required. Another necessity for the successful treatment of it is that the practitioner be able to give the required amount of time and patience to it. In this respect I have to admit that during the last few years of my stay in New York, when I had to attend to a large practice and do scientific work besides, I had to give up the treatment

of pyorrhea almost entirely. My first experience in the treatment of this disease dates back to 1873 (I think), at the time when Riggs gave a clinic in Brooklyn and when W. H. Atkinson introduced the use of aromatic sulphuric acid for dissolving necrotic bone. I then had several patients afflicted with pyorrhea, in the treatment of which Atkinson assisted me, making use of aromatic sulphuric acid, tincture of iodin, chlorid of zinc and iodid of zinc. One of these patients, whose treatment was quite successful, was exhibited at the clinic of the First District Dental Society of New York.

Still another matter of great importance to be considered in the treatment of pyorrhea is the necessity for the thorough coöperation of the patient. If a patient is unable or unwilling to follow our directions in keeping the mouth as clean as possible the treatment is certain to be unsuccessful, whatever care we may have bestowed upon it. We have some patients who pay the utmost attention to the cleanliness of their mouths, and in these instances it is a pleasure, unless they are in bad health, to observe how rapidly the cure progresses. Others, who are not so particular, often require more than double the time to effect a cure, while a few patients who completely neglect the rules of oral hygiene are usually incurable.

Many authors claim that to be successful in the treatment of pyorrhea the practitioner ought to have had a good medical education, and I must admit that such a knowledge is of great value in the treatment and diagnosis of this disease, as well as in every pathological condition of the mouth, but I do not consider it an absolute necessity. Though in the search for the cause of pyorrhea a full medical education will be of great assistance, yet I do not think that any dental practitioner should or ought to treat his patient for a systemic disease. The treatment of such diseases should be referred to the family physician. In severe cases of pyorrhea, when the patients are not aware of any disturbance in their system, I always consult with their family physician and leave the general treatment to him.

I also have to acknowledge that in the cases in which there is one of the above-named systemic diseases present a complete cure of the pyorrhea is not always possible as long as the disease lasts, yet usually we are able to cure it by local treatment so far that the destructive inflammatory process around the teeth is checked. Whenever an exacerbation of the systemic disease occurs it again leads to disturbed nutrition in the oral cavity and usually a reappearance of the pyor-

rhea is the result. Fortunately in the majority of instances the systemic depression which caused the pyorrhea has been but temporary and in these instances, if the treatment has been correct, we will always be successful. By a successful cure I mean the complete disappearance of pus and all inflammatory conditions around the teeth. The gums must be attached again to the necks or roots of the teeth, and offer a fair resistance to the introduction of a moderately fine instrument, even in those places which formerly were occupied by the so-called pockets. In advanced cases where much of the alveolar process has been destroyed by the inflammation the teeth will have an elongated appearance and remain loose for some time, till a portion of the lost bone has been reformed, but the alveolar process will never regain its original height. When the teeth are too loose to be left without a support I either apply a retaining apparatus or tie them by means of fine silk ligatures. I believe in saving the natural teeth whenever I can and it distresses me to admit that sometimes I am unable to save a tooth. I do not want to be understood that I can or do save every tooth, but I try to save whatever I can. As long as the root of the tooth has not been absorbed and has yet some pericemental attachment, however loose it may appear, I usually succeed in saving it.

As does everyone who has been successful in the treatment of pyorrhea, I regard the thorough removal of every particle of calcareous deposits and necrotic tissues of the utmost importance. The application of medicines, whatever they may be, is of no value whatsoever unless all the deposits have previously been removed from the roots of the teeth. When more than six or eight teeth in the mouth are affected I do not as a rule attempt to remove all the deposits at one sitting, which I never extend over one hour. Throughout the course of treatment I see the patient once a week. The reason for this interval of time will be explained hereafter. Contrary to the views of some, I am not in favor of removing much of the necrotic bone at once, as it is impossible to determine by the sense of touch or sight how far the necrosis extends into the healthy bone tissue. If the formation of pus still continues three or four weeks after the removal of the calculi, it is a certain sign that either some calculi or necrotic tissues are left upon or in the surroundings of the roots of those teeth. In these instances, if a careful examination reveals the presence of necrotic bone, I usually remove

of it whatever I think necessary by means of spoon excavators or burs in the engine. In removing the calculary deposits, which requires a keen sense of touch, great patience and much practice, I make use of some scalers of almost every set found in the dental depots, excavators, burs, or any instrument that will reach the required place with the least pain and laceration of the soft tissues. To lessen the pain during the operation of severe cases I make use of a concentrated, syrupy solution of cocain phenate, which I apply under the gum for about four to five minutes upon a small piece of cotton. This solution I have found to be the safest of all the cocain solutions and mixtures I have ever employed. The carbolic acid of this preparation to a certain extent prevents the cocain from being absorbed, while the cocain, as long as the solution is saturated, inhibits the caustic action of the carbolic acid. When the calculary deposits have been removed and the pockets have been rinsed out with warm water and a suitable antiseptic, an application ought to be made of some medicine which will stimulate a new growth of the tissues surrounding the loosened teeth. For this purpose many remedies have been recommended, but the writer at present makes use of only three of them, viz.: Lactic acid, trichloracetic acid and iodid of zinc. Lactic acid, which has been recommended especially by W. J. Younger, I employ only in severe cases where there is much necrosis of the alveolus present, and where I desire a powerful hyperplastic inflammatory reaction, which at the same time will separate the necrotic bone from the healthy tissue. For this purpose I make use of the acid in full strength, injecting it as a rule not more than once during the treatment, by means of an all-glass syringe with a platinum point. This I insert into the pocket of the gum as far as it will go. The action of concentrated lactic acid upon the tissues is quite irritating, and precautions must be taken that it does not touch the gum, lips or tongue. This can easily be accomplished by placing a roll of cotton on either side of the tooth where the injection is to be made. The introduction of lactic acid under the gum is quite painful, and whenever I employ it I obtund the surroundings by cocain phenate. Trichloracetic acid is obtained in the form of needle-shaped crystals, and as this acid is quite hygroscopic it readily liquefies when exposed to air. In this condition it is a powerful caustic, promoting healthy granulations and to a certain extent dissolving the calculi. Most practitioners use this acid in

weak solutions, injecting it into the pockets of the gum, others employ it in full strength by means of fine pieces of orange-wood, while I apply it in still another manner, to be described hereafter. Iodid of zinc is another remedy which acts admirably in all inflammatory conditions of the gums depending upon the presence of sordes. In instances where we observe no pus and little solid calculus upon the necks of the teeth, a condition always noticed after constitutional diseases, such as typhoid, etc., and also in the treatment of those sensitive conditions of the necks of teeth present after the application of trichloracetic acid, when the pyorrhea alveolaris is almost cured this medicament is invaluable.

As mentioned before, we notice that in all inflammatory conditions of the gums sordes accumulates very quickly even in mouths which are kept moderately clean. Such deposits occur especially on those places which are not disturbed by mastication, circulation of saliva or the tooth brush. If we examine the necks of teeth about a week after we have thoroughly removed all deposits we will observe a little accumulation of sordes again, however careful the patient may have been in cleaning the teeth. For the purpose of examining the necks and roots of the teeth in regard to their cleanliness, I wind a few fibers of cotton tightly around a thin pulp-canal plugger, and with this I rub somewhat hard around the neck of the tooth. When we examine the cotton on the point of the instrument we usually find it to be covered with sordes. This proves, unless the gum becomes somewhat attached immediately after the first operation, that a deposit of sordes will again form in about a week's time. Recognizing the fact that no wound can heal which contains such deposits, I adopted the following treatment: After the removal of the calculary deposits, I make an application either of lactic or trichloracetic acid. For the latter I employ the same pulp-canal instrument as for an examination in the manner before stated. I tightly wind a few fibers of cotton around the point and dip this into the acid. Care must, however, be exercised not to use too much cotton or to wind it too loosely around the instrument, as it takes up too much of the trichloracetic acid. Thus, instead of acting locally as desired, it runs into the mouth, injuring the mucus membrane, and if swallowed causes serious disturbances of the stomach. In applying the acid I introduce the point of the instrument covered with cotton as far under the gum as it will go, with moderate pressure, and then

rub with considerable force against and around the neck and root of the affected tooth, thus wiping ont all necrotic tissues as well as the freshly accumulated sordes and even the remains of small fragments of hard calculi. This process I repeat about once a week during the whole treatment.

I then instruct my patient to rinse out all the pockets and interstices between the teeth at least twice or three times a day with a powerful syringe and electrozone diluted with about eighty or ninety parts of warm water. Electrozone, which is nonpoisonous, is made by passing a current of electricity through sea or salt water, and has given me more satisfaction than any other antiseptic, but it has two bad qualities which I have to mention here. In some mouths, and especially when the patients have employed it in the pure state, it forms a brownish, sticky deposit upon the teeth, which sometimes becomes quite dark, while another objection is its disagreeable taste In regard to the bad taste of the electrozone, I have to state that most of the patients easily become accustomed to it. The brownish deposit, however, in some instances adheres so strongly to the teeth that at times I am obliged to remove it by means of scalers. The discoloration, however, is never permanent, as the teeth after polishing always show their original color. If the patient's health is not too greatly depressed, and the directions of keeping the mouth clean are carried out, I always expect to see the inflammation surrounding the teeth subside in from two to four weeks after the first removal of the calculi.

Subperiosteal or blind abscesses, as mentioned before, are frequently met with in the mouths of patients suffering from pyorrhea, and as they are not caused by the presence of septic matter in a pulp-canal they require different treatment. I have noticed that they occur more frequently upon the labial and buccal than upon the lingual surfaces of the alveolus, and in the majority of instances the pus finds it way along the neck of the tooth into the mouth. Whenever these abscesses require to be opened I accomplish it by means of a fine pulp-canal plugger, around which I wind a few fibers of cotton, dipped into phenate of cocain. The instrument is gradually introduced along the neck of the tooth into the abscess. If treated in this manner it gives but little pain. There being no open wound on the gum where the particles of food can enter, the abscess heals readily and unless it recurs gives no more trouble.

Sometimes I have seen these abscesses opened by cutting in the direction of the axis of the tooth, dividing the free margin of the gum, a procedure which will, after the healing of the abscess, permanently expose the neck and a part of the root of the tooth. In most instances these abscesses recur, and such teeth are eventually lost by the absorption of their roots. The pulp usually remains alive in the tooth after the occurrence of a subperiosteal abscess, and I believe it exerts an influence upon the recurrence. I have noticed that whenever I have been able to extirpate the pulp of the tooth and fill the canal satisfactorily the abscess seldom recurs. In this respect I have also observed that applications of arsenious acid have little effect upon the pulps. There is usually present, through the inflammatory reaction of the abscess, a chronic hyperplastic pulpitis. The dentin in these instances is often extremely sensitive to the action of the bur and sometimes to such an extent that the patients are unable to bear the pain of opening the pulp-chamber.

I have of late made use of the Bauschwitz apparatus, which I employ for obtunding all sensitive cavities; and in the majority of instances it has given me great satisfaction. The apparatus consists of a cylinder containing carbonic dioxid gas, which is heated by an electric current to about 50 degrees Celcius while the gas passes through the handpiece and is directed into the cavity of the tooth. For this purpose the tooth has to be made dry by the rubber dam or by other means. Before the gas is introduced a drop of diluted sulphuric acid, from five to ten per cent in strength, is applied. In this manner I have been able to open the pulp-chambers of the teeth with but little pain, although I have to admit that I have met with some teeth where the apparatus has failed to work satisfactorily. When I have opened the pulp-chamber of the tooth I inject an aqueous solution of cocain hydrochlorid, and after waiting about five minutes there usually is but little pain in removing the pulp. —*Review.*

RELATION OF THE NOSE, THROAT AND EARS TO THE TEETH. By Thomas F. Rumbold, M.D., St. Louis. Read before the St. Louis Dental Society. During the last thirty years I have frequently observed that the presence of diseased gums and decayed teeth slowed the recovery of chronically inflamed mucous membrane of the nose, throat and ears. I have also observed that

not infrequently a chronic inflammation of the mucous membrane of the nasal cavities and the antrum of Highmore will cause an inflammation of the gums. At the first visit of a patient I make as thorough an examination of the gums and teeth as I do of the nose, throat and ears; and in all cases where the gums and teeth are affected I insist that the services of a dentist are indispensable to the successful treatment of the case. While it is interesting and important to know that the blood-vessels and nerves of the teeth and those of the nose, throat and ears are very intimate, yet we are not dependent on anatomical examination to establish the fact that a very close relationship exists between these organs. In fact, it is our clinical observations in many instances that prove our anatomy, physiology and pathology of the parts to be correct. I will give some clinical facts that clearly establish this close relationship:

Nose and Ear Disease Maintained by Diseased Teeth. Mr. H., aged 37 years, a lawyer, consulted me in regard to a furious tinnitus aurium. He told me that the noise in his left ear was so great as to deprive him of sleep, and the tone of so melancholy a nature as to suggest suicide as a means of relief. During the three weeks previous to seeking my advice and treatment the symptoms had been greatly aggravated from the effect of using a nasal douche—at that time very popular and recommended by every physician for nasal trouble. I learned that he had suffered from nasal catarrh since boyhood, and that he had aural catarrh as well. After six weeks' treatment the inflammation in the nasal passages and ears was greatly relieved, as was also the tinnitus. At this time the noise in the ears remained about the same, except when I tried to inflate the middle ear, which always made matters worse. I did everything for the relief of the tinnitus that was advised in the text-books of the day. The more closely I followed the authors the greater noise in the ear. Finally my patient said that when I "left his ear alone" and mildly treated the nasal catarrh the tinnitus lessened. After this I did not treat him for ten days, the result being an increase of inflammation in the nasal passages, also an increase of the noise in the ear. I then treated him a few weeks longer, but I became discouraged at the unfavorable result. While in this frame of mind I discovered that he had decayed teeth and several whose crowns were entirely gone, leaving five or six half-covered roots in his jaws. As the majority of these were on the left side I advised that the roots

be extracted and the diseased teeth and gums treated. The more I thought about the case the more firmly I was convinced that what had at first been merely suspicious was in reality the obstacle that stood in the way of successful treatment, namely, the decayed teeth. I insisted upon a removal of them, and felt warranted in making a non-compliance on his part sufficient cause for a discontinuance of treatment, and so save me the opprobrium of a failure. Dr. Homer Judd stated that he did not know the affection of the ear would be relieved by treating the decayed teeth, but he knew that the nerves of the teeth and some of those of the ears were branches of a common nerve; that pain in the teeth frequently caused pain in the ears, and *vice versa;* and as the patient's teeth were in a very bad condition he advised that his mouth be made sound by treating his gums and teeth. This he said should be done, even though it did not have the effect of benefiting his catarrhal troubles. The patient submitted to the dental treatment, and before it was completed a marked benefit accrued to both the nasal and aural trouble; and the tinnitus, although not entirely removed, had decreased to such a degree that in a few weeks' time he was barely conscious during the daytime of its presence. I have treated him almost every fall since for catarrhal trouble, but the ear symptom has never given him serious annoyance.

Since this experience I have seldom omitted to examine the teeth and gums of every patient. In many instances I believe that my course of treatment has been greatly shortened and results rendered more permanent by the beneficial effects of the dental treatment on the general health, as well as on the local trouble. Many additional cases could be cited, if necessary, to prove the correctness of this view. The following statements of patients are appended because the symptoms are rare and show more fully the relationship between the teeth and the other organs of the system.

Nasal Inflammation Maintained by Diseased Roots of Teeth. J. C., a dentist, aged 42 years, consulted me in regard to catarrhal trouble. The treatment was so far successful that at the end of four weeks' time he experienced but little annoyance from the complaint. Considering himself so much improved, he discontinued treatment for a few weeks, when the original trouble returned. I had failed to make a careful inspection of his teeth, for the reason that he wore an artificial plate. However, as I began to search for the cause of

the return of the discharge I discovered that he had several roots under the plate, from which there was a continual discharge of pus, and learned that at such times as the catarrh was most troublesome and he had neuralgia in the head his teeth were painful. I advised immediate extraction of the teeth, and the patient readily consented. The effects were all that were anticipated, and his neuralgia seldom troubled him afterward.

Voice Affected by Diseased Teeth and Gums. Miss G. W., aged 22 years, a singer in one of our church choirs, was treated for naso-pharyngeal catarrh and for impairment of her voice. On the first visit I noticed that her teeth were in a bad condition, and advised that she secure the services of a dentist. She promised to do so, but from fear of the pain that the dentist would give her she deferred attending to the matter. The treatment relieved the catarrhal trouble, but the inflammation of the vocal cords was but slightly ameliorated. Becoming discouraged at the lack of success attending the treatment, she left me and secured the services of another physician, who treated her for several months with like results. In the spring of 1877 she again visited me for treatment, and I again insisted that she procure the services of a dentist. She complied, and the catarrhal treatment that was continued for six weeks gave results that were quite satisfactory.

Irritation of the Throat by Sensitive Teeth. Mr. ——, minister, aged 52 years, required treatment for hoarseness. During his visits he casually mentioned the fact that if any food became impacted between the first and second molar teeth of the lower jaw he felt impelled to clear his throat by hawking. On one occasion a small piece of fish bone became fastened between these teeth. He made frequent unsuccessful efforts at its removal, which resulted in rendering him completely aphonic for two days. The removal of the bone relieved him of the throat trouble entirely, and in a few days' time his voice returned with but a few treatments.

Palpitation Due to Sensitive Teeth. Mrs. ——, aged about 32 years, stated that frequently after contracting a bad cold she had attacks of palpitation of the heart; also that during a period of three years past she had at no time received dental treatment without giving rise to palpitation. On one occasion her dentist was compelled to leave a tooth half-filled, so severe was the attack of palpitation.

Arm-Pain Due to Sensitive Teeth. Miss ——, aged 19 years,

told me that during the past two winters she always had pain in the left arm if she attempted to bite any hard substance, such as an attempt to crack a filbert or a hazel nut, on the left side of her mouth. The pain in the left arm was in every respect similar to the pain not infrequently experienced by patients who have a severe catarrhal inflammation in the left ear and nostril.

Eczema of the Face Due to Decayed Teeth. Mr. ——, aged 42 years, desired treatment for a continual clearing of the throat and occlusion of nasal passages. He also had skin disease on one side of his face. Local and constitutional medication had the desired effect upon the throat and nasal passages, and the eczema was also ameliorated. As the patient had defective teeth in his mouth I recommended that he engage the services of a dentist to remove them. Dr. A. H. Fuller extracted the roots of nine teeth. In two weeks the eczema was nearly well, and in one month more there were no signs of it. There are some diseases that originate in the gums and teeth, but ultimately have the most prominent symptoms elsewhere.

Eczema of the Whole Body Due to Diseased Gums. A very interesting case was that of the late Dr. Thomas S., aged 43 years. He came to me to be treated for an abscess in the left tonsil. His breath was very much affected and his gums were much inflamed, but he had no decayed teeth, as his dentist assured him. After the opening of the abscess he discontinued his visits for a little more than one year. Then he returned to be treated for a bad inflammation of the nasal and post-nasal cavities. As his breath was still more disagreeable and his gums still inflamed, I recommended him to visit Dr. Fuller, which he did, receiving one treatment, the effect of which was marvelous in improving his nasal inflammation and his general health. I gave him but a few nasal treatments after this, but recommended his continuance of the dental treatment as essential to his complete recovery. This advice was not followed until nearly a year had elapsed; then he went to a dentist whom I fear did not understand the case. He recommended the Doctor to brush his teeth with some kind of medication, but this was not followed. Three years after I first saw him he came to me again for treatment of his nose, throat and ears. His gums were still more diseased, his breath still more offensive, and in addition he had a disease of the skin—not only of the face and hands, but all over the body. I gave him a few nasal treatments, and recommended him to see a dermatologist. This

he did, but as this latter physician's prescription was rather severe he soon discontinued it. The case now became rapidly worse, so that he could not leave his room, and he ultimately died. I saw him about one week before his death. At that time the fetor from his breath and body filled the house; it was perceptible the instant one entered the hall door. I want it understood that not one of his teeth was decayed, or so I was informed by two competent dentists who made very careful examinations.

Stomach Trouble Due to Diseased Gums. Mr. Alex. B., aged 52 years, was sent to me to have a large polypus in the left nasal cavity removed. During our conversation about his symptoms he stated that he was a continual sufferer from dyspepsia. As I noticed that he had a few decayed teeth, and gums that were much inflamed, I recommended him to engage the services of a dentist. This he did about three months after I had removed the polypus. I saw him about one year after this and removed some inspissated cerumen from his left ear. He said that the dentist had cured his dyspepsia, and I then recollected the fact of his diseased gums. He went to his dentist for about three weeks, and almost immediately he noticed that his stomach trouble began to improve, and in three or four months afterward all his dyspeptic symptoms disappeared permanently. In this instance not only did the toxins from the gums mix with the food and thus injure the stomach, but the irritation of the pneumogastric nerves that go to the teeth had a debilitating effect on the digestive powers of the stomach.

Eye Trouble Due to Diseased Gums. T. C. T., aged 20 years, came for treatment of frontal headache. During the examination I discovered that he had inflamed gums, and recommended that he visit his dentist. This he vetoed because of the fear of pain. Subsequently his mother desired him to go to the dentist to have his teeth cleaned, which he did; and after that visit he had very sore gums, so that he could not for a few days take any but liquid food; and his gums have been inflamed since that time, now about four years. During his visits I asked him how long he had been wearing glasses, for I had seen him as a boy, when he did not use them. He informed me that his eyes became very weary toward the end of the day. He consulted an optician, who sold him a pair of "nose-pinchers." These relieved his eyes very much, but the relief was of short duration. Then he visited the optician again, who changed the

glasses, to his marked relief. His browache soon left him, but as his breath was very offensive I recommended him to visit a dentist, one who would not hurt him. This he did. I saw him six months afterward, at which time his gums were well, nor did he require the use of glasses. His eyes were afterwards carefully examined and pronounced in every way normal. I do not think that the diseased gums alone were the cause of the eye trouble, but these gums had to be put in a normal condition before he recovered from his eye weariness.

Cases of this kind are not common, but still not very rare. I could give a large number of them. In some cases the most prominent symptom is felt in the teeth, but the disease has its actual origin elsewhere. I am satisfied that very few cases of tic douloureux originate in the teeth, but I have never had a case that did not at different times have teeth extracted in the hope of relief. The same may be said of many cases of disease of the antrum of Highmore. I have certainly had fifty cases of this affection without the least sign of decayed teeth or disease of the gums. Certainly if the cavity is in an inflamed condition for several months both the gums and teeth may become involved. But I have never had a case of this disease that did not have diseased nasal cavities long before the commencement of the antral disease. I do not mean to say that all cases of this disease originate in the nasal passages, for dentists would naturally not get this kind of case, nor would I see all cases that seem to start in the teeth.

Ear Trouble from a Diseased Third Molar. Miss X. Y., aged about 30 years, called to be treated for a "rising in the head," meaning a pain in the left ear. This pain occurred most frequently after eating, but never in the morning. The pain commenced in the ear and ran down to the ramus of the jaw. She was under treatment for about three weeks, but the earache was but slightly ameliorated. Not only this, but she had a new pain in the left side of her throat. On inspection I found the third molar on that side was so much decayed as to be a mere shell, and the gum around it was dark red with inflammation. This tooth was removed, and soon all the ear and throat trouble disappeared.

High Arches and Irregular Teeth. The most rapid growth of a human being is during the first year of its age. During this time it increases in length about eight inches. It is during this year that it

runs the greatest risk of losing its life by disease. Ninety per cent of its illness is due to colds in the head, and I think that every infant has one or more of these colds during this year. I have never known of an exception. Of course this is due purely to ignorance of the proper care that should be taken of the infant. It is during this year that ear troubles and adenoid and tonsil growths commence. To bring about these abnormal conditions the inflammation is not at its greatest severity. If it is, death ensues by extension of the inflammation to the brain through the ears or by inflammation of the lungs occasioned by the head-cold. If the intensity of the inflammation of the nose or ears is not quite severe enough to take life, the blood supply of the part most affected may be curtailed, thus causing an impoverishment of the part inflamed, and consequent arrest of growth, as is sometimes seen in the ears, producing deaf-muteness. More frequently this starvation is observed in the jaws, especially the upper, thus slowing its growth, if not arresting it for some years. This period of slow growth is not usually over three years, and many times about one year, at the end of which time the blood supply appears to have resumed its normal quantity; but the jaw once retarded in its growth—especially if for a long period—is not apt to catch up to the size it would have been had not disease affected the part. The teeth of the affected jaw do not seem to have been impoverished to the same extent as the jaw, which is probably due to the fact that the blood supply to these organs is not the same as that of the jaw—the jaw growing from the periosteum, while the teeth have a special artery for their nutrition. If the teeth were supplied by the same blood-vessels and nerves as the jaw they undoubtedly would be equally dwarfed, but we see that they grow large enough to fill the alveolar groove as though the jaw had not been stunted. Their irregular eruption is due to the lack of room in the jaw, not to any fault in their nutrition.

The abnormally high arch of the soft palate is due alone to arrest of development of the vomer, while at the same time the outer portion of each maxillary bone continues to develop *paripassu* with the remainder of the head. In this way the stunted vomer holds the arch of the palate up to itself, while the outer portion of each maxillary bone continues to grow downward. A good proof of the correctness of this theory is the fact that no horizontal bucking of the vomer is seen in heads having abnormally high arches of the palate.

An English physician suggests that the high arch is due to the obstructing effect of growths in the nasal passages. These, in preventing the free access of air through these openings during inspiration, bring about an air-pump effect that sucks the hard palate upward. He contends that this air-pump effect, maintained day and night for several years, will draw the hard palate into a high arch. There can be no doubt that this air-pump effect of the nasal growths will not only maintain, but increase inflammation of the rear portion of the nasal passages—that is, the portion behind the growths. This inflammation means an increase of blood supply—or, in other words, an increase of nutrition of the part—which results in overgrowth. It is in this way that the abnormal growths are caused to form in the nasal passages—there being, of course, a slight irritation to start the inflammation. If the air-pump act sucked the arch upward beyond its normal position the vomer would certainly sometimes show horizontal buckings, but this is never seen so far as I know.

It will be observed that I have stated that congestion will cause arrest of development as well as increase of development. The apparent inconsistency disappears when we understand the mechanism of these two opposite conditions. Upon the size of the capillaries of a part depends its normal growth, its abnormal development, its arrest of development, or the death of the part. In the case of congestion, if the increase in the diameter of vessels is so excessive that their walls are thinned to such an attenuation as to allow the escape of blood-serum into the surrounding tissue, producing a dropsy of the part, the flow of blood is very much slower and consequently lessened. If the quantity of blood is lessened the quantity of nourishment is also lessened; consequently the part is not nourished so as to maintain its growth in due proportion with the other parts of the body. In other words, the part is prevented from developing normally on account of this lack of nourishment. If, on the other hand, the blood-vessels are only slightly increased, so that an increased quantity of blood flows, and this supplies an excess of nutrition to the part, there must be an increased growth of that part. An excess of growth of a part must mean an excess of blood supply; an arrest of development must mean an abnormally slow supply of blood, but sufficient to maintain the life of the part. If the congestion is so great that the blood ceases to flow through the part, then death of that part takes place. It is plainly seen that death of

a part, or arrest of development of a part, or abnormal increase of growth of a part, will depend upon the quantity of the blood supply.

It follows that the surgeon-dentist who will judiciously occasion a slight increase of the circulation of the blood supply of the part that has suffered arrest of development will be successful in causing the stunted part to increase in size, so as to *make it catch up* with the other parts of the head. I feel sure that in this way alone can dwarfed jaws be made to grow to the normal size.

These views of the mechanism of the dwarfed jaw and irregular eruptions of the teeth are the result of careful dissections I made during the years of 1892 and 1893 and during two months of 1895. At those times I made a large number of sections of the heads of children and adults. No one can make a careful dissection of an injected superior maxillary bone having a high palatine arch and not plainly see the effects of excessive inflammation in changing the size and course of the blood vessels. Since 1892, at which time I accidentally noticed the abnormal changes in anatomical structure, I have made this a study, and feel certain that what I have said concerning this important subject will be found to be correct.—*Dental Era.*

Filling of Incompletely Developed Root-Canals.—By Dr. F. Frauner, Vienna. (*Wiener Zahnarztliche Monatsschrift, Cosmos.*) The essayist discusses the use of paraffin as a substance for the filling of root-canals, and states that while it has already been used for this purpose it has never before been employed specially for the filling of incompletely developed roots. He calls attention in a general way to the necessity of avoiding the passage of the filling material through the apical foramen, and says that the contact of paraffin with the soft tissues does not produce any reaction, and that for this reason it has been used in surgery for many years. He then takes up the properties which a root-canal filling should possess, and says that paraffin embraces the most important ones, *i. e.*, impermeability, unabsorbability, the possibility of its being carried to the end of the root, slowness in setting, easy manipulation, the possibility of its being removed after its introduction into the canal, etc. A description is given of cases in which paraffin was used to advantage in the filling of the root-canals of teeth in children. The paper concludes with the author's method of manipulating the paraffin, which consists in filling a metal syringe with the softened material, which is then allowed to harden and is put aside until wanted for use, when by slightly heating the syringe the paraffin melts, and can be easily introduced in the canals of the upper teeth. For the lower teeth the paraffin can be melted upon a spatula, carried to the canal, and worked in by means of a broach.

Letters.

A ROW IN THE ODONTOLOGICOSTOMATITICAL SOCIETY.

(AS TOLD BY THE OFFICE BOY.)

There was another meetin' of the Odontologicostomatitical Society at the Boss's office last night, an' Dock Measley he read a Paper on the Subject, "How to Get and Hold a Dental Practice." It was a rattlin' good Paper, I thought, yet I noticed Dock Puffy an' Dock Hotty both went to Sleep. like it wasn't nothin' that interested them. The Boss he got right clost down in front of Dock Measley, where he set, his mouth gappin' Wide Open, swallerin' the words like it was a Christmas dinner to the Orphans. It was a Offul Giveaway, an' a Turrible Advertisement of how bad he needed to know them things. I wondered that he hadn't no more Tack. Dock Timrus, who was in the Chair, he noticed how eager an' interested the Boss was, so seein' everybody settin' in a Doze, like they'd been Chloroformed, after he'd called fer Remarks on the Paper, says he: "Dock Contour, you seem Interested in the subject of the Paper; I'll ast you to open the Discussion."

The Boss he kind o' slunk away at that, like he suddenly reelized how he'd showed too Blame' Mutch interest. He blushed an' stammered, an' says he, "I reckon there's others more Competent to open this Discussion than me. I haint paid such Offul Good attention, an' I was absorbed in thinkin' about Something Else durin' the readin'."

That certainly was the finest exhibition of Presents of Mind, an' clean-cut, off-hand Lying I ever seen anybody give, let alone the Boss. I never Suspicioned he could be that Quick-Witted. An' after he'd done it, he got up an' poked the Fire, lookin' so blame' Absent-Minded that I was Haf Fooled myself. I had to Own Up that the Boss was makin' Rapid Strides in the way of Improvin'.

So then, after a long spell o' Waitin' Dock Measley he got up himself. Says he, speakin' a Soft, Insinuatin' tone, "There's some Extry Fine points in this Paper, an' I flatter myself very few dentists would of thought of them." He stopped to take a Chaw of Tobacco, glancin' 'round the room composedly, like he knowed everybody would Admit the Truth of that. I've saw the Time when I'd of

thought this was pure, unadulterated Gall in Dock Measley, an' you could Easy See most of the Dentists thought that now. But I seen now he had an Object in sayin' that, which was to wake the men Up, an' git them Red-Hot, so they'd Jump On him directly. Dock does love a Fite, especially with Dock Puffy er Dock Hotty. They say fer a Fact, that he ain't even afeard of the Heavy Weights among the New York er Chicago dentists, but will Wade In an' Exchange blow fer blow with them, an' the harder the blowin' the better pleased he is. He certainly is a Tuff Specimen. All the dentists seems to Dispise him, an' to Like him better than any other young dentist in the City. That's what the Boss said about him, only the Other Day. He explained that it was what they call a Paradocks, whatever that is. The Boss he Laughs about it, an' he says he wouldn't want any better Fun than to go to the Big Dentists' Convention in St. Louis, ef they have one at the time of the Big Fair, an' see Dock Measley meet all Comers at Ketch-Weights, as fast as they want to come in the Ring with him. He thinks Dock Measley would more than Hold his Own. An' so do I. He's a Glutton fer Punishment, no mistake about that.

So then nobody didn't say nothin', and Dock Measley he let himself out a Notch er two more. Says he, "The chief Beauty of this paper of mine is its Thorough Originality. Lots o' dentists writes papers that's mere reproductions of other men's ideas, er even copied from text-books, an' palm 'em off as Original. But that ain't my Style."

Dock he paused a minute, an' blowed his Nose like it was a Steamboat makin' a Landing. I seen him kind o' peerin' out sideways from behind his Handkerchief, this way an' that—on the Sly, of course—to see ef anybody was agoin' to Take him Up. I knowed well enough he hadn't reely nothin' pertickler to say, only he wanted to git Dock Puffy er Dock Hotty Fitin' Mad. An' I seen Right Away he was Succeedin'. Dock Puffy was gittin' Red in the Face, an' direckly up he Bounced. Says he, interruptin' Dock Measley, "I wish to congratulate the Essayist on his Consumin' Modesty. The paper certainly is Original. It contains a number of ideas that directly concern the *Trade* of Dentistry. What relation they may be supposed to have to the *Perfession* of Dentistry I am unable to conceive. It is a paper which ought to prove absorbingly interesting to Advertising Dentists. If the Reader of the paper could persuade

himself to have it printed as a Circular, to be distributed in the Markets and Electric Cars, I think it would surely bring him a Well-Merited reward of Notoriety."

Dock Puffy give a Big Sniff an' set down, an' the way everybody looked at Dock Measley, you'd of supposed he was About Due to git Turned Out of the Society. But Dock he Glanced 'Round the room with a Never-Teched-Me Air, pintin' with his finger at this member an' that one, like it was in Sunday School, an' who'd be the next Little Boy to say a Verse. So then Dock Hotty he Got Up, an' he was Cryin' Mad, an' it looked like you couldn't hold him till the Gong would Tap. Some of the Younger Members turned pale, an' it certainly did seem like somebody had Orter Interfere, 'cause it wasn't right, him bein' a good Twenty Pounds heavier than Dock Measley. It seemed like Dock was Doomed, spite of all. The way Dock Hotty sailed into him was enough to scare a Goat into a Fit. He said he'd heered all sorts o' papers read in the Society, an' some was Original, but the only claim this paper had to Originality was its not havin' no Bearin' on the subject o' Dentistry. The suggestions in it was of a kind that would likely be Useful to Corn-Doctors, but it was an Affront to the Intelligence of the members of this Society, to read such a paper before them. He'd therefore recommend that it be Throwed Out, an' all mention of it Excluded from the Minutes.

So even that never Fazed Dock Measley, but he kep' on noddin' pleasantly to other members to say some Observations, like he was Chairman an' Executive Committee an' everything, an' Dock Timrus down in the alley Shootin' Craps. The Young Dentists, encouraged by the Hosstyle Attitude of the precedin' speakers, lit into the Essayist like it was in Police Court, an' Dock Measley up fer stealin' Door-Mats. Dock he'd kind o' Nod Approval now an' then, encouragin' everybody to do their Dirtiest, an' never mind him. There he sat smokin' a Segar an' blowin' Smoke-Rings up at the Ceilin', like it was some Quack Dentist in Chiny they was Abusin', an' nothin' to him what they said.

After everybody had got done he got up an' Inquired was they any more would like to say somethin', er would any that had spoken like to Say Over what they'd said Previous. They wasn't none, so he Got Up Himself. He said it afforded him the Highest Gratification to find his paper so Favorably Received, an' ef he'd of Foreseen the

Kindly Sperit which was agoin' to Pervade the Discussion, he'd of made the paper Longer, an' Elaborated some p'ints only casually teched on. (It was easy to see Dock was talkin' Sarcastic, now.) As fer Dock Puffy's observations concernin' the *Trade* o' Dentistry an' Advertisin' Dentists, he'd like to ast the Gentleman about *his* style o' Advertisin'.

So then Dock Puffy he Got Up, stiff as a Ramrod, an' says he, "It ain't my practice to advertise, no way. I ain't accustomed to bein' insulted in this Dental Society by Upstarts, neither."

Everybody looked like they expected Dock Measley to Fall Dead at that. But he never—he never even looked Flustered. In a minute saye he, "They's various ways o' Advertisin'; some does it by sendin' cards, er by notices in the Daily Papers. Others does it with ridin' about the streets in Automobiles, er by havin' Niggers in Fancy Regalia to wait on the Bell, an' so on. It's more a question of Money than of Ethics. Perfessions is supposed to be built up on Fundamental Principles of Fraternity, Esprit de Corps, an' so on. Some has suspicioned though, that the Dominatin' Idee of certain ambitious members of the Perfession is to climb up On Top at any hazard, an' ef possible git in a class by theirselves, er at least, in a class of a Select Few, an' the Diavolo take the hindermost."

This was certainly a Extreme View, as Dock Measley himself admitted to me later, when him an' me was Goin' over the doin's of the Evenin'. He told me the reason he Done It was he was Achin' fer somethin' to be a-doin', an' expected it would bring on a Whalin' Big Row, his sayin' that. An' it did, too, right away. Dock Puffy he come at Dock Measley with his head down (this I'm goin' on to describe from this on, is Figerative Language, like the Boss Says sometimes)—I say, Dock Puffy he come on like a Bull, with his head down, an' Dock Hotty he Dodged About, watchin' fer a Chance to git in a Lick. In a minute all was Confusion an' Turmoil, Dock Measley bein' down on his back, an' Dock Puffy piled on top o' him, Gougin' an' Scratchin', an' on top o' him was sprawled Dock Hotty, an' others piled up most to the Chandelier. (I mean, it was a Offul Hot Discussion, an' everybody abusin' Dock Measley at once. It wasn't a reel Scratchin' Match, of course.)

Dock Measley he was like a Wild Cat by this Time, with twelve dogs a-pitchin' on him at once. Sech a fiery Spit-Devil as he was, a-spinnin' 'round like the Dial of a Nickle-in-the-Slot machine, snarl-

in' an' gnashin' his Teeth, an' sendin' the sparks a-flyin' like a Electric Buzz Saw. It did seem like they orter somebody hold the dentists back, so many a-pitchin' on him at once. But directly out of the Whirl would come a Yell of Agony, an' a Dog would drop out—er I mean a Dentist—an' presently another would let out a Howl, an' Let Go, bleedin' an' Whinin'—like as ef it was a reel Dog-Fite, I mean. The Scrap didn't seem to last more than a good Three Minutes, an' then Dock Measley was seen emergin' from a Cloud o' Dust, limpin' a trifle, but with the Bristles on his Neck a-stickin' Straight Up, like he dared them to Fetch On Some more Dogs—er I mean Dentists. You could easy see how mutch he Enjoyed the Mix-Up. They wasn't reely no Umpire, but ef you ast me I'd say Dock Measley won, easy.

After the Scrimmage Dock Timrus he was so Scairt that he fergot to adjourn the Meetin', so it jis' adjourned itself. Dock Measley looked reel Sprightly an' Cheerful, an' says he, "Say, Fellies, what's the reason we can't have a little o' this kind o' Pepper Sauce an' Injun Turnip every meetin'? Best Meetin' this society has had fer a Year."

Then he done to Dock Hotty the same as he done to Dock Puffy, the last meetin' the society had here; he blowed his Ear full o' Segar Smoke, an' he stuck his Thumb in so none couldn't Git Out, an' then he looked Quick to see ef any smoke come out the Other Ear. None didn't come out, as I could see, and Dock Hotty he slung him off tollable Violent, an' says he, "Looky here, Young Feller; you want to Let Up on bein' so Familiar on Short Acquaintance. Do you understand!"

So Dock he seemed to Reckon he'd best not try any more, fer the Present, an' while the rest was drinkin' Milk an' Sandwiches he set down an' writ a Editorial sayin' how Offul Fine this paper was, an' nothin' to equal it ever before Published, an' he sent that an' his Paper to one o' the Leadin' Dental Journals, as I seen when he writ the Address on a Envelope.

Cincinnati, Ohio. FRANK W. SAGE, D. D. S.

ACCIDENTAL OPENING INTO A HEALTHY ANTRUM IN TOOTH EXTRACTION.—It is altogether unnecessary to treat antral cavities that have been accidentally opened, for the reason that soon after the extraction the blood from the alveolus becomes coagulated and closes up the opening. Should the opening be large, however, means must be employed to close it.—DR. SZABO, *Cosmos.*

The Dental Digest.

PUBLISHED THE FIFTEENTH DAY OF EVERY MONTH
At 2231 Prairie Avenue, Chicago,
Where All Communications Should be Addressed.

Editorial.

CROWN COMPANY'S LATEST MOVE.

As chairman of the Dental Protective Association we have been receiving during the past month a large number of inquiries from dentists concerning a letter recently sent out by the Crown Company. Thinking that some of our readers might not have seen the letter we reproduce it herewith:

L. T. Sheffield, D. M. D., 26 West Thirty-second street.
New York, June 6, 1903.

Dear Doctor:—The recent decision of the Circuit Court of Appeals (Second Circuit) in the suit of International Tooth Crown Company against Hanks Dental Association has affirmed, in all respects, the judgment of the court below, so far as that established that the company's Low patent, covering bridgework, was for a new and useful invention, and consequently good and valid in law, the only question referred to the Supreme Court being the right to examine defendant before trial.

The undersigned, Mrs. L. T. Sheffield, widow of the late Dr. L. T. Sheffield, is the president and practically the sole owner of the International Tooth Crown Company. She personally desires to cease these lawsuits, which have now been going on for so many years and which have been such a considerable source of expense to both parties. It is her desire to give these patents and all that belong to them to the dentists of this country, providing that something is paid by each one who is using or has used these methods. The sum suggested is $25, for which the International Tooth Crown Company will issue to each dentist paying the same a document releasing him from all further claims under these patents or any others now owned by it. In order that it may be decided quickly as to whether the above plan will work, this option will not be extended longer than *sixty* days from above date, *and is without prejudice.*

Please communicate with me at above address. On receipt of check full release will be sent. Very truly yours,

MARY SHEFFIELD.

We would advise our readers to pay no money whatever to the Crown Company because of this communication or any other. The Protective Association has fought that Company for about sixteen years in nearly all the courts of the country, and they have not in any instance obtained a dollar from any member of the Association under any such litigation, and in our opinion they never will. There is no probability of the Crown Company ever beginning another suit against a member of the Association, but if they should do so there is not the slightest chance of their being successful. Any such suit against a member will be defended entirely without cost to him, as heretofore. We do not care to discuss the plans of the Association regarding this matter at this time, but we earnestly advise the members not to contribute this sum of $25 to the Crown Company, when the Association has been victorious through so many years. We would also call attention to the fact that this sum demanded by the Crown Company is $5 more than the entire amount of money each member has paid the Association for defense and protection in the courts for the last sixteen years.

Notices.

KENTUCKY STATE DENTAL ASSOCIATION.

The Kentucky State Dental Association held its annual meeting at Bowling Green last month and elected the following officers: President, J. W. Clark; Vice-president, J. C. Montgomery; Secretary, W. R. Randall; Treasurer, F. R. Wilder.

ROCHESTER DENTAL SOCIETY.

The annual meeting of the Rochester, N. Y., Dental Society was held May 19, and the following officers were elected: President, H. S. Miller; Vice-president, F. J. Tarrant; Secretary, F. W. Proseus; Treasurer, W. A. Windell; Librarian, B. S. Hert.

NEBRASKA STATE DENTAL ASSOCIATION.

The Nebraska State Dental Association held its annual meeting at Lincoln, May 19-21, 1903, and elected the following officers: President, H. O. Shannon; Vice-president, A. Gaiser; Secretary, W. R. Clark; Corresponding Secretary, H. R. Hatfield; Treasurer, H. T. King.

WASHINGTON STATE DENTAL SOCIETY.

The annual meeting of the Washington State Dental Society was held at Spokane, May 28-30, 1903, and the following officers were elected: President, A. W. Phillips; 1st Vice-president, R. A. Munroe; 2d Vice-president, B. S. Scott; Treasurer, P. D. Appleby; Secretary, G. MacGregor.

NORTHERN OHIO DENTAL ASSOCIATION.

The Northern Ohio Dental Association held its forty-fourth annual meeting at Cleveland June 2-4, 1903, and elected the following officers: President, W. H. Fowler; Vice-president, W. T. Jackman; Corresponding Secretary, W. G. Ebersole; Recording Secretary, C. D. Peck; Treasurer, D. A. Allen.

IDAHO STATE DENTAL SOCIETY.

The seventh annual meeting of the Idaho State Dental Society was held at Boise, June 9, and the following officers were elected: President, J. G. Burns; Vice-president, W. C. Stalker; Secretary, A. W. Cate; Treasurer, J. J. Easter; Ex. Com., E. C. M. Jules, E. H. Maberly, A. W. Judd, W. C. Stalker, E. E. Dutton.

SOUTH DAKOTA STATE DENTAL ASSOCIATION.

The annual meeting of the South Dakota Dental Society was held at Redfield, June 3-5, and the following officers were elected: President, C. E. Stutenroth; Vice-president, E. S. O'Neil; Secretary, J. W. Ross; Treasurer, W. H. Jackson; Librarian, D. St. I. Davies. The next meeting will be held in June, 1904, at Aberdeen.

LOUISIANA STATE DENTAL SOCIETY.

The Louisiana State Dental Society held its annual meeting at New Orleans, May 20-22, 1903, and elected the following officers: President, J. H. Johnston; 1st Vice-president, S. J. Harrall; 2d Vice-president, R. L. Zelinka; Recording Secretary, C. G. Lanaux; Corresponding Secretary, A. L. Plough; Treasurer, Chas. Mermilliod.

COLORADO STATE DENTAL ASSOCIATION.

The annual meeting of the Colorado State Dental Association was held in Denver, June 16-18, 1903, and the following officers were elected: President, E. W. Varley; Vice-president, F. Y. Herbert; Secretary, H. W. Bates; Treasurer, Wm. Smedley, Sr. The next annual meeting will be held in Colorado Springs, in June, 1904.

MASSACHUSETTS STATE DENTAL SOCIETY.

The thirty-ninth annual meeting of the Massachusetts State Dental Society was held at Boston, June 3-4, 1903, and the following officers were elected: President, W. P. Cooke; 1st Vice-president, F. S. Belyea; 2d Vice-president,

J. J. F. McLaughlin; Secretary, E. O. Kinsman; treasurer, J. T. Paul; Librarian, Thos. W. Clements; Editor, F. E. Delabarre.

MISSISSIPPI STATE DENTAL ASSOCIATION.

The annual meeting of the Mississippi State Dental Association was held at Vicksburg, May 19-21, 1903, and the following officers were elected: President, J. B. Askew, Jr.; 1st Vice-president, J. S. A. Dupree; 2d Vice-president, P. D. Halcombe; Secretary, T. B. Wright; Treasurer, P. P. Walker. The next meeting will be held at Jackson, in May, 1904.

GEORGIA STATE DENTAL SOCIETY.

The annual meeting of the Georgia State Dental Society was held June 9-11, 1903, and the following officers were elected: President, A. M. Jackson; 1st Vice-president, Frank Holland; 2d Vice-president, S. H. McKee; Corresponding Secretary, H. M. McNeill; Recording Secretary, C. Whittington; Treasurer, H. A. Lawrence; Editor, H. H. Johnson.

VIRGINIA STATE DENTAL ASSOCIATION.

The Virginia State Dental Association will meet at Hot Springs, Va., July 21-23, 1903—one day later than previously announced—so as to accommodate those desiring to attend the meeting of the National Dental Association at Asheville, N. C., one week later.

F. W. Stiff, Chairman Ex. Com.

SOUTHERN BRANCH NATIONAL DENTAL ASSOCIATION.

There will be a business meeting of the Southern Branch of the National Dental Association in the ballroom of the Battery Park Hotel, Asheville, N. C., immediately on adjournment of the National body at first morning's session, Tuesday, July 28. The object of this meeting is to consider the election of officers, time and place of holding the next regular meeting, reception of delegates to this meeting of the National, and the disposal of other matters of business pertaining to the Branch.

L. G. Noel, President; S. W. Foster, Secy.

WISCONSIN STATE BOARD OF DENTAL EXAMINERS.

The next meeting of the Wisconsin State Board of Dental Examiners will be held in Superior, Wis., July 20, at 9 a. m. All applications for examinations should be in by July 15. Candidates must be graduates from a recognized dental college, or have been regular practitioners of dentistry for four years, or apprentices to a reputable dentist for five years. Besides the regular written examination, the candidate will be required to insert a contour gold filling, furnishing all instruments and materials.

J. J. Wright, Secy., Milwaukee.

MISSOURI STATE DENTAL ASSOCIATION.

The thirty-ninth annual meeting of the Missouri State Dental Association was held at Kansas City, May 19-21, 1903, and the following officers were elected: President, J. H. Kennerly; 1st Vice-president, F. W. Franklin; 2d Vice-president, F. H. Achelpohl; Recording Secretary, H. H. Sullivan; Corresponding Secretary, S. T. Bassett; Treasurer, J. F. Fry. Board of Censors, J. C. Pasqueth, A. L. Bridgeford, DeCourcey Lindsley; Committee on Ethics, J. B. McBride, J. A. Prosser; Committee on Publication, W. G. Goodrich, O. J. Fruth; Committee on New Appliances, J. F. Austin. The next meeting will be held in St. Louis, the third Tuesday in May, 1904.

S. T. BASSETT, Cor. Secy., St. Louis.

DR. DANIEL C. WHITE.

Daniel C. White, D. D. S., died at his home in Alton, Ill., June 11, 1903, at the age of 81 years.

This records the passing of a pioneer in dentistry—of one of the oldest, if not the oldest, dentists in southern Illinois, Dr. White having been in continuous practice in the same place for nearly fifty years. He was born in Concord, N. H., October, 1822, where he grew to manhood, and became a journeyman machinist. His health failing, his physicians pronounced the malady consumption, a disease to which several of his family had already succumbed, and they gave him but a limited time to live. He rebelled at the edict, came to Akron, O., in the search of health, and as he regained his strength took up dentistry in his uncle's office. Subsequently he practiced for a time in Boston, and in 1854 came to Alton, Ill., where, with scarcely any interruption, he practiced dentistry until his strength failed him about six months ago.

His mechanical training served him well in his chosen career, and he became an expert metal and porcelain worker. In those days they formed the principal part of a dental practice, and he acquired a reputation which at that time extended over a large part of southern Illinois.

Nature had endowed Dr. White with extraordinary strength and a physique which gave him a reputation as an athlete. He was very fond of all athletic sports, and the taste clung to him to the very last.

Of a retiring and unassuming disposition, he was devoted to his family, consisting of a wife and one daughter, and his friends, and when he died he rounded out a career which, by reason of his sterling integrity, won the respect of all who knew him.

The lesson conveyed by the above brief sketch should encourage many a weary soul in the profession. It shows clearly that dentistry is by no means an unhealthy profession, and how, with care and judgment, even an impaired constitution may live out the allotted span.

Dr. White's professional brethren in the city attended his funeral in a body.

C. B. ROHLAND.

NATIONAL DENTAL ASSOCIATION.

Following is a partial list of clinics promised for the coming meeting in Asheville, N. C. An excellent list of papers is being prepared by the various sections. Judging from the preparations that are being made, the coming meeting will be an unusually interesting and profitable one.

A. H. PECK, Rec. Secy. L. G. NOEL, Pres.

CLINICS.

1. Dr. Levi C. Taylor, Hartford, Conn. "Hygienic Fillings."
2. Dr. S. Eldred Gilbert, Philadelphia. "Seamless Crown Outfit."
3. Dr. R. C. Brophy, Chicago. "Something in Porcelain Work."
4. Dr. Garrett Newkirk, Los Angeles, Cal. "Advantages of the Hollow Post, Combined with the Inlay Principle for Cantilever and Bridge Abutments."
5. Dr. D. O. M. Le Cron, St. Louis. "Modern Porcelain Art and Oil Colors, as Applied to Dental Prosthesis."
6. Dr. W. H. G. Logan, Chicago. "Pyorrhea Alveolaris."
7. Dr. Howard T. Stewart, Memphis, Tenn. "Partial Removal and Decalcification of Cementum in Treatment of Riggs' Disease."
8. Dr. F. Lee Hollister, Wilkesbarre, Pa. "A Demonstration of the Application of Dr. Angle's Fracture Bands in Fractures of Maxillæ, Superior and Inferior."
9. Dr. Geo. Evans, New York. "The Cementation of Crowns and Bridges with Gutta-Percha Cement."
10. Dr. J. H. Feagan, Spartanburg, S. C. "Demonstrating the Advantages of an Improved Flask in Investing and Packing Vulcanite Dentures."
11. Dr. Robert J. Cruise, Chicago, "Administration of Nitrous Oxid with a New Nasal Inhaler."
12. Dr. Edwin C. Blaisdell, Portsmouth, N. H. "The Use of Non-Cohesive Gold."
13. Dr. Russell Markwell, Galveston, Texas. "Porcelain Crowns."
14. Dr. Paul W. Evans, Washington. "Specimens of Porcelain Work and a Method of Making Seamless Gold Shell Crowns."
15. Dr. F. J. Capon, Toronto, Canada. "Porcelain Crowns, Sections and Inlays."
16. Dr. Alfred Owre, Minneapolis. "Cavity Preparation in Natural Teeth."
17. Dr. Burton Lee Thorpe, St. Louis. "A Method of Protecting the Cervical Margin in Cement Fillings."
18. Dr. D. J. McMillen, Kansas City, Mo. "Combination Cohesive and Non-Cohesive Gold."
19. Dr. H. Herbert Johnson, Macon, Ga. "An Improved Modification of the Richmond Crown."
20. Dr. R. Ottolengui, New York. "Models and Appliances Representing Artificial Vela and Obturators for Cleft Palate Cases."
21. Dr. Wm. Leon Ellerbeck, Salt Lake City, Utah. "Porcelain Fillings and Furnace Construction."

22. Dr. Chas. P. Pruyn, Chicago. "Root-Canal Filling, Using Sandarac Varnish and Gold Wire Points."

23. Dr. Hart J. Goslee, Chicago. To be announced.

24. Dr. Rudolph Beck, Chicago. To be announced.

25. Dr. W. T. Reeves, Chicago. "Porcelain Inlays."

26. Dr. Joseph Head, Philadelphia. To be announced.

27. Dr. H. B. Tileston, Louisville, Ky. "Gold Inlay, Using Copper Amalgam Matrix."

28. Dr. Harry P. Carlton, San Francisco. To be announced.

29. Dr. W. A. Capon, Philadelphia. "Porcelain."

30. Dr. L. E. Custer, Dayton, Ohio. "Porcelain."

31. Dr. B. Holly Smith, Baltimore. "Some Novel Attachments for Removable Bridge and Metal Plate Work."

32. Dr. W. E. Grant, Louisville, Ky. "Abutments for Esthetic Crown and Bridgework."

33. Dr. A. R. Begun, Des Moines, Iowa. "Some New Things in Gold Work."

34. Dr. Emory A. Bryant, Washington. "Replaceable Facings for Crown and Bridgework and Repairs."

35. Dr. Henry C. Raymond, Detroit. "Porcelain."

36. Dr. Geo. W. Schwartz, Chicago. "Method for Constructing a Continuous Gum, Upper Set of Teeth. Table Clinic."

37. Dr. C. Edmund Kells, New Orleans, will exhibit models showing his method of extracting impacted third molars. He will also give a demonstration in X-ray work.

38. Dr. Robert E. Payne, New York. "Implantation."

39. Dr. Wm. K. Slater, Knoxville, Tenn. "Porcelain Work."

40. Dr. Thos. P. Hinman, Atlanta, Ga. "Porcelain Inlays."

41. Dr. C. L. Alexander, Charlotte, N. C. "Gold Inlays."

42. Dr. J. Y. Crawford, Nashville, Tenn. "Clinic on the Management of Children's Teeth; also on Management of Mouths of Very Aged People."

News Summary.

A TOOTH in the head is worth two on a plate.—*Surg. Clinic.*

G. S. DECKER, a dentist at Newton, N. J., died May 24, 1903.

W. A. LYON, a dentist at Washington, D. C., died June 6, 1903.

H. T. CAMPFIELD, a retired dentist at Augusta, Ga., died June 17, 1903.

A. H. FOWLER, 78 years old, a dentist at Ithaca, N. Y., died June 5, 1903.

J. E. SANDERSON, 25 years old, a dentist at Ottawa, Ill., died May 23, 1903.

B. SHIRLEY, a dentist at Burnt Cork, Ala., was shot in a feud May 26, 1903.

J. G. BENJAMIN, a dentist at Muskegon, Mich., was drowned June 1, 1903.

O. C. SPRINGER, a dentist at Cleveland, O., died May 19, 1903, from cancer.

J. C. ALLEN, 60 years old, a dentist at Philadelphia, died suddenly June 7, 1903.

E. P. HOYT, 75 years old, a retired dentist of New York City, died June 9, 1903.

W. C. GARDINER, 61 years old, a retired dentist at Batavia, N. Y., died June 18, 1903.

R. J. JEFFRIES, 59 years old, a retired dentist at Natchez, Miss., died May 18, 1903.

J. W. HECKLER, a dentist at Buffalo, N. Y., died June 16, 1903, from blood poisoning.

G. WHIPPLE, 50 years old, a dentist at Cuba, N. Y., died May 18, 1903, from pneumonia.

B. M. ACKMAN, a young dentist at Windfall, Ind., died May 10, 1903, from consumption.

W. E. BLAKENEY, 81 years old, a retired dentist of New York City, died June 3, 1903.

J. C. DELISLE, 65 years old, a dentist at St. Charles, Mo., died June 2, 1903, from asthma.

D. J. GRIFFITH, 27 years old, a dentist at McKeesport, Pa., died suddenly June 21, 1903.

H. L. KEPHART, formerly a dentist at Hollidaysburg, Pa., died suddenly June 11, 1903.

O. F. SMITH, 45 years old, a dentist at Cambridge, Mass., died June 13, 1903, after a long illness.

J. J. WILLEY, a dentist at Denver, Col., had an epileptic stroke June 16, 1903, and is not expected to live.

D. L. BASTIAN, 66 years old, a dentist at Clinton, Mass., was killed June 6, 1903, in an automobile accident.

H. L. DICKERMAN, 53 years old, a dentist at Taunton, Mass., and formerly in practice at Providence, R. I., died June 4, 1903.

MENTHOL SOAP rubbed over the exposed skin keeps away the most vicious mosquitoes and makes fishing enjoyable.—*Alk. Clinic.*

TO KEEP HYDROGEN DIOXID.—Tightly cork the bottle and keep it standing inverted in a vessel of water.—*Dominion Dental Journal.*

LARYNX ELEVATION.—Naegeli says that headache, facial neuralgia and toothache can be relieved by repeatedly elevating the larynx a minute at a time.—*Surg. Clinic.*

TO CLEAN VULCANITE FILES.—Apply chloroform and clean with stiff brush. This will remove all the rubber packed in in trimming plates.—W. H. WHEAT, *Dental Hints.*

DETROIT DENTAL COLLEGE ALUMNI ASSOCIATION met June 11, 1903, and elected the following officers: President, T. J. Collen; Secretary, J. S. Hall; Treasurer, E. Frumveller.

PRECOCIOUS TOOTH-ERUPTION.—Dr. P. Pandatyis reports (*Progrès Dentaire, Cosmos*) the eruption of three incisors, two upper and one lower, in an infant eight days old.

GUM MASSAGE.—In the treatment of pyorrhea massage of the gums, when the soreness leaves, is an excellent thing, using a little powdered sulphur on the fingers.—ROBERT GOOD, *Cosmos.*

AUSTIN (TEX.) DENTAL SOCIETY was formed June 18, 1903, and the following officers were elected: President, C. M. Aden; Vice-president, F. W. Smith; Secretary and Treasurer, J. M. Ferguson.

VOICE GOES WITH TOOTH.—A man at Jersey City had his tooth pulled June 4 and has not been able to speak aloud since. Not a woman patient has been in the dentist's office since the occurrence.

COUNCIL BLUFFS (IA.) DENTAL SOCIETY was organized June 10, 1903, and the following officers were elected: President, H. S. West; Vice-president, C. E. Woodbury; Secretary and Treasurer, R. O. Williams.

FINES FOR DENTISTS.—According to newspaper report warrants have been issued for the arrest of several dentists in Louisville, Ky., who have failed to pay the $10 license fee, which the city ordinance calls for.

PHOTOGRAPHING CANDIDATES.—Some state medical examining boards are adopting the practice of photographing the candidates for registration to prevent impersonation. Will it ever come to this in dentistry?

RESOLDERING.—To prevent the unsoldering or refusing of parts previously united, coat such surfaces with crocus (ferric peroxid) or a solution of plumbago or whiting in alcohol or water.—H. J. GOSLEE, *Items.*

PULP-DEVITALIZATION IN DECIDUOUS TEETH.—One or two applications of aqua ammoniæ is sufficient in most cases to devitalize an exposed deciduous pulp. Apply on a pledget of cotton in the cavity.—*Ohio Dental Journal.*

LAKE ERIE DENTAL ASSOCIATION closed its annual meeting at Cambridge Springs, Pa., May 21 and elected the following officers: President, C. W. Dunn; Vice-president, J. M. Crosby; Secretary, C. H. McAlpin; treasurer, J. H. Heivly.

KANSAS CITY DENTAL COLLEGE ALUMNI ASSOCIATION organized May 21, 1903, and elected the following officers: President, J. P. Root; 1st Vice-president, E. M. Huler; 2d Vice-president, B. L. Foster; Secretary, T. E. Purcell; Treasurer, S. J. Renz.

TOOTHACHE DROPS.—The *Oest. Zeitschrift fur Pharmacie* (*Cosmos*) publishes the following formula for the treatment of odontalgia: Oil of cloves, oil of cajuput, of each 10 parts; chloroform, acetic ether, of each 5 parts; menthol, 3 parts; camphor, 1 part.

TO PREVENT FORMATION OF RUST IN HYPODERMIC NEEDLE POINTS.—Put the needles in a bottle, cover with pure gasolin, and cork tightly. When wanted for use, blow through the needle and dip in alcohol, and the odor will disappear.—H. L. PRATT, *Dental World.*

EXTRACTION SPOILED LOOKS.—The authorities in New York recently refused to allow a German emigrant to land because he was so ugly that they thought he would never find work in the United States. The man's looks were spoiled twenty years ago by a clumsy dentist.

LAWRENCE (MASS.) DENTAL CLUB held its annual meeting May 18, 1903,

and elected the following officers: Pres., F. W. Bevington; Vice-president, C. W. Parker; Secretary, J. P. Reardon; Treasurer, W. H. Caffey; Ex. Com., C. A. Kearshaw, E. A. Freeman, M. A. Digman.

FORMALDEHYD ANTIDOTE.—In case of poisoning from formaldehyd we have an accessible and reliable remedy in ammonia. It may be given in the form of ammonia water, a few drops well diluted, or the aromatic spirits, or a solution of ammonium acetate.—*Merck's Archives.*

MINNESOTA UNIVERSITY DENTAL DEPARTMENT ALUMNI ASSOCIATION held its annual meeting and banquet June 3, 1903, and elected the following officers: President, B. A. Herrick; Vice-president, J. M. Pike; Secretary and Treasurer, J. R. Holmberg; Historian, T. B. Hartzell.

BOOKS NOT GERM-CARRIERS.—The idea that books are the means of circulating disease is overthrown by the Philadelphia Public Library, which states that although the attendants handle the books many times more than any reader, contagious disease is almost unknown among them.

LEBANON VALLEY DENTAL ASSOCIATION held its annual meeting at Harrisburg, Pa., May 19-20, 1903, and elected the following officers: President, W. P. Clark; Vice-president, H. W. Bohn; Recording Secretary, H. J. Herbein; Cor. Secy., P. K. Filbert; Treas., C. B. Wagner.

DIAGNOSING THE PRESENCE OF PUS.—The application of heat relieves pain resulting from simple acute inflammation, but has the opposite effect when suppuration is present. A valuable hint in solving the question of the presence or absence of pus.—D. K. LEWIN, *Therapeutic Gazette.*

CHEMICAL TEST FOR SODIUM DIOXID.—Place about 1 gm. of sodium dioxid in a clean, dry test-tube and add one or two c.c. of water. If the chemical is efficient enough oxygen will be generated to inflame a glowing splinter held at the mouth of the tube.—J. P. BUCKLEY, *Review.*

CONTOURING AMALGAM FILLINGS.—Have on hand three or four widths of baby ribbon with smooth edges. Cut off strips of suitable size, pass between the teeth, and use to contour the amalgam before it sets. It is strong and thin and will readily adapt itself to the contour of the tooth.—*Brief.*

HIS LAST REMARK.—The funny editor lay dying. Round his couch were gathered those who waited to hear his last words. Suddenly his lips moved as in an effort to speak. "What is it?" they queried. A smile crossed his pale face as he replied, "Wait a moment, I am just getting out a die-jest."

FIRES.—Geo. Stebbins, Aurora, Ill.; June 18, total loss.—W. Ellifritz, Toledo, O.; June 14, slight loss.—Harvard Dental Parlors, Seattle, Wash.; June 16, loss $300.—T. H. Nenman, Plymouth, Wis.; June 11, loss $500, insurance $350.—W. Reed, Santa Rosa, Cal.; June 4, slight damage to office, but was personally badly burned.

DIVORCES.—The wife of W. P. Horton, Jr., a Cleveland dentist, has brought suit for divorce, alleging cruelty. In 1895 his first wife secured a divorce from him.—The wife of L. T. Hallum, a dentist at White's Creek, Tenn., has brought suit for divorce.—Mrs. E. V. Marshall has obtained an absolute divorce from her husband, a dentist of Brooklyn.

REPAIR KIT.—Johnny had just become the proud possessor of a bicycle, so the thing was naturally on his mind. One day the family doctor left his case of medicines and instruments, and Johnny's mother sent him over with them. Much to the physician's surprise Johnny left the case with the remark: "Here, Doctor, you left your repair kit at our house."—*Puck.*

SERVED THEM RIGHT.—A firm of traveling dentists recently stayed a week in a Colorado town and by advertising low prices, etc., succeeded in doing work for a great many people. Copper was used instead of gold, and fraud and incompetence characterized all the work. The people are sadder, but we doubt if they are much wiser, as the public certainly does like to be humbugged.

NEURALGIA.—Naegeli announces that he has frequently caused almost immediate cessation of cephalalgia and facial neuralgia, as well as forms of long-continued odontalgia, by simply elevating the larynx, holding it well upward for sixty or seventy seconds. This frequently requires to be repeated several times, but quite as frequently one single attempt will prove successful. —*Public Health Jour.*

COMPLIMENTARY.—"The Digest is a splendid journal and an honor to American dentistry. I prize it above all others." L. C. Bryan, Switzerland.—"I can't get along without the Digest," W. E. Holt, Newark, N. J.—"The Digest is a very valuable journal." R. Cretors, Mt. Etna, Ia.—"I take more delight in perusing the pages of the Digest than those of any other journal." S. R. Swain, Marengo, Ia.

JUDGMENT FOR DENTIST.—A dentist in San Francisco recently sued a patient to recover a bill of $71. The latter tried to evade payment by pleading that the dentist obtained the money illegally, inasmuch as his assistant who did the malleting was not registered. Upon the dentist explaining to the judge the duties of an assistant the defense was declared "frivolous" and judgment was awarded to the dentist.

TUFTS DENTAL COLLEGE ALUMNI ASSOCIATION held its annual meeting June 16 and elected the following officers: President, J. W. Forbes; 1st Vice-president, W. I. Brigham; 2d Vice-president, I. J. Weatherbee; Recording Secretary, L. M. Woodward; Corresponding Secretary, G. B. Squires; Treasurer, W. Rice; Editor, J. R. Piper; Ex. Committee, H. H. Piper, F. S. Fogg, E. A. Johnson, F. B. Stevens.

The BIG FOUR ROUTE is the best line to take to the National meeting at Asheville, N. C., as it is the only line from Chicago making direct connection with the trains to the south in Cincinnati. The equipment and service are thoroughly up to date. For further information address J. C. Tucker, G. N. A., 238 S. Clark St., Chicago. A special car will probably be chartered for the dentists, so reservations should be made early.

THE DIFFERENCE.—A young lady, with a penchant for farming, was explaining at length the many difficulties she encountered in pursuing her fad. "I really am a farmer," she protested, and then added, regretfully, "although it must be confessed that almost all I plant I lose."

"Therein differing from me," courteously rejoined her table companion, a rising young physician, "for I find in my case that almost all I lose I plant."

ACCIDENTS.—June 9, a gasoline stove exploded in the office of a dentist at McLeansboro, Ill., causing some damage.—June 13, a vulcanizer exploded in the office of a dentist at Boston, breaking the windows and somewhat damaging the office.—May 25, a dentist at Pawtucket, R. I., had a narrow escape, as his vulcanizer—a new one—blew up while he was vulcanizing some teeth. He was thrown to the floor, but not seriously injured, and things in the office were pretty well shaken up.

PREMONITION OF IRREGULARITY.—When a child reaches the age of four a very important change takes place. When everything goes on regularly and the blood supply is good, there should be quite marked separation between the anterior teeth. If this separation does not take place, and the child does not lose its baby face, we may prophesy future deformity, and should study the case carefully, correcting what may be wrong in nourishment, exercise, etc., often thus avoiding mechanical interference.—Eben M. Flagg, *Items.*

FATALITIES.—June 16, a woman at Waverly, Ill., died under chloroform after the extraction of three teeth. The anesthetic was administered by her physician.—May 21, a woman at Hamilton, Ont., died from heart disease while under the influence of an anesthetic in a dentist's chair.—May 20, a young man at Oakland, Cal., died after lying in a stupor for several hours. An autopsy revealed a blood clot on his brain, and his family think that he was poisoned by the medicine used by a dentist who devitalized the pulp of one of his deeth.

PROBERT AT IT AGAIN.—Our readers will remember that on several occasions in the past we have exposed the schemes of A. C. Probert, who was the promoter of "the St. Luke's Hospital," at Niles, Mich. We warned the profession against buying any of the bogus certificates, medals, etc., which Probert offered, so he gave up the scheme. He has recently been arrested on complaint of Dr. John B. Murphy, the celebrated surgeon, for fraudulently using Dr. Murphy's name in promoting "the Christian Hospital," an institution which sold certificates, etc., to physicians. Probert won't be satisfied until he gets into jail again.

CLOSING INCISED WOUNDS.—Cleanse the wound and dry thoroughly. Apply a piece of adhesive plaster on either side of the wound, of size to give ample area for adhesion, and not nearer the edge of the wound than one-quarter of an inch. Insert interrupted sutures through the edge of the plaster, draw together and tie. This coaptates the edges of the wound better than stitches through the skin and avoids that painful process. It also does away with the possibility of stitch-hole abscesses, or of particles of suture being left in the wound. It prevents stitch-mark scars, and there is no tearing out of the stitches through the bruised tissues.—*Therapeutic Gazette.*

AMBIGUOUS.—"I notice," said the curious patient, upon leaving the chair, "that your card states—'No Charge for Administering Gas When other Work is Done,' and I have been wondering just what that means. In the first place, what would any one want with gas when the other work is done?

Generally the gas is needed before and while the work is being done On the other hand, if it means that no charge is made when the administration of gas is the only work required, do I understand that you give gas free of charge to dope-fiends, and that—" but by that time the dentist had charged his hypodermic syringe, so the patient drilled out.

RUST REMOVAL FROM STEEL.—To remove rust from polished steel, potassium cyanid is excellent. Soak, if possible, the instrument to be cleansed in a solution of potassium cyanid in the proportion of one ounce of cyanid to four ounces of water. Allow this to act until all loose rust is removed, and then polish with cyanid soap. The latter is made as follows: Potassium cyanid, precipitated chalk, white castile soap. Make a saturated solution of the cyanid and add chalk sufficient to make a creamy paste. Add the soap cut in fine shavings, and thoroughly incorporate in a mortar. When the mixture is stiff cease to add the soap. It should be remembered that potassium cyanid is a virulent poison.—*Power and Transmission.*

MURPHY BUTTON.—A Chicago newspaper man was asked to speak at a recent banquet over which Dr. John B. Murphy presided as toastmaster. "It was suggested to me," he said, "that it might be a delicate compliment to the toastmaster for me to wear a Murphy button on this occasion. I went up and down State street to all the department stores searching for one. I found college buttons, fraternal buttons, G. A. R. buttons, but no Murphy buttons. Meeting a physician, I asked him what a Murphy button might be. He told me that the Murphy button was worn in the abdomen—on the inside. Then he rattled off a lot of stuff that was Greek to me. I caught the idea, however, and I have worn one in honor of the toastmaster. I take it that the Murphy button is the refined name for what we used to call the 'belly button.'"—*Chicago Clinic.*

DIAGNOSING DISEASE OF THE MAXILLARY SINUS.—S. Pietro (*Archivo Italiano di Otolgia e Larynalogia*) calls attention to a new method of diagnosing disease of the antrum of Highmore. The instruments required are two rubber tubes 160 cm. long, having at one end a rubber tip for the ear and at the other a cylindrical glass tube 3 cm. long, and a tuning fork of sixty-four or ninety-six vibrations. The tips are placed in the ears and the glass tube on the outer wall of the antrum, cuspid fossa, corresponding points on the alveolar border, the free margins of the molar teeth, etc. The tuning fork is then set in vibration and placed on the dorsum of the nose. If either antrum contains pus the vibrations will be heard more distinctly on that side. The writer has made observations on dead bodies and on the living, and claims this to be our most certain method of diagnosing antrum disease.

DAMAGE SUITS.—Some two years ago a woman at Jamestown, N. Y., went to a firm of dentists in that city to have some teeth extracted, and about a year afterwards she brought suit for $2,000 damages, alleging that through the operator's carelessness she swallowed a tooth and a mouth-prop, which remained in her throat for some time. At the trial it was proven that the tooth which she showed was not her own, and that the mouth-prop which she produced could never have remained in her throat as alleged. The case was

therefore decided in favor of the dentists.—A man at Cincinnati has sued a dentist in that city for $5,000 damages, alleging that through careless extraction of a tooth blood-poisoning set in.—A woman has sued a "painless dental company" in Philadelphia, alleging that one of the operators—who was a freshman dental student—pulled out a piece of her jaw-bone thinking it was the root of a tooth.—The guardian of a nine-year-old boy has sued the proprietor of a painless dental parlor in New York City for $25,000 damages. It is alleged and seemingly with good cause that the dentist in extracting the tooth broke the jaw-bone, blood-poisoning set in and abscesses formed on various parts of the body. A large one on the right leg has made the boy lame for life.

DENTITION.—The argument that dentition is a purely physiological function, and therefore cannot cause pathological phenomena, is regarded by W. J. Robinson in *Merck's Archives* as untenable. When the gums are hot and tense, then frequent rubbing with the following combination will give proper relief:

℞ Potassii bromidi, gr. xx.
Chloralis hydratis, gr. x.
Tr. aconiti rad., m. v-xv.
Spts. chloroformi, ℥j.
Mucilaginis, q. s. ad ℥j.

M. Sig.: Apply to the gums frequently by rubbing.

At the same time he recommends that the following be given internally:

℞ Pot. bromidi, gr. iii-v.
Chloralis hydratis, gr. i-ij.
Aq. des., q. s. ad. ℥ij.

M. Sig.: To be given dose by the mouth.

The foregoing mixture may be given in double the size dose per rectum, using starch-water as a vehicle.

NAPKIN POINT.—BY GEORGE E. HUNT, D. D. S., Indianapolis (*Brief*). There is one point that perhaps some of the younger men have not had demonstrated to them, insignificant, perhaps, but useful. If it is desired to keep a left lower tooth dry for ten, fifteen, or twenty minutes, act as follows: Fold or roll a napkin into a strip one and a half inches wide and not less than seven or eight inches long. Have the patient raise the tip of the tongue to the roof of the mouth. Place the end of the napkin against the lingual surfaces of the right lower teeth and pass it across the mouth under the tongue to the lingual surfaces of the left lower teeth. Let the tip of the tongue be depressed. Pass the remainder of the napkin back across the mouth from left to right, this time over the tongue. Stand to the right and in front of your patient. Place a cotton roll between the cheek and left upper teeth to occlude the parotid duct. Hold the tongue firmly down against the floor of the mouth with the fingers of the left hand, the thumb being under the chin. The lower fold of napkin occludes the submaxillary and

sublingual ducts and the upper fold enables the operator to hold the tongue down without it slipping. The whole secret of success lies in keeping the tongue firmly down against the floor of the mouth. The patient may at first make unconscious spasmodic efforts to raise the tongue to swallow, but if it is held in place these efforts will cease. For keeping dry the right lower teeth, reverse the operation.

EXAMINING BOARD AFFAIRS.—May 26, the governor of Arkansas appointed the new state board of dental examiners as follows: Chas. Richardson, S. I. Rivers, C. S. Sims, A. T. McMillan, W. L. Watson.—At the last meeting of the Connecticut Board fourteen out of twenty-two candidates passed the examination.—At the last meeting of the California Board the examinations were held under the new law, and twenty-two out of seventy-six candidates failed.—June 19, the Commissioners appointed A. D. Wakeley on the District of Columbia Board, to succeed H. J. Allen.—May 25, the governor appointed E. D. Brower on the Iowa Board, to succeed F. P. Webber.—At the last meeting of the Louisiana Board nine out of fourteen applicants passed the examination.—At the last meeting of the Mississippi Board twenty-one out of thirty-three applicants passed the examination.—The New Jersey Supreme Court has recently handed down a decision upholding the state dental law.—June 11, the Virginia Board elected the following officers: Pres., H. W. Campbell; Secretary and Treasurer, R. H. Walker, Norfolk.—At the last meeting of the Washington Board nineteen out of thirty-three candidates passed the examination.—The Wisconsin State Legislature has passed a new dental law which gives the examining board much more power and also raises the requirements.

ROBBERIES.—May 12, a thief stole a quantity of gold plate and scrap from the office of a dentist at Salida, Col., but was arrested while trying to dispose of same.—May 24, $150 worth of stuff was taken from the office of a dentist at Cairo, Ill.—May 17, a dentist at Charleston, Ill., was robbed of $25 worth of gold.—May 13, about $30 worth of gold was taken from the office of a dentist at Sullivan, Ill.—May 22, two dentists at South Bend, Ind., were the victims of burglars, each losing a considerable amount of stuff.—June 16, a man at Springfield, Mo., was sentenced to two years in the penitentiary for stealing gold from dental offices.—June 10, a quantity of scrap gold was stolen from the office of a dentist at Buffalo, N. Y.—Last month two dentists at Cincinnati, O., were robbed of gold and personal property.—June 15, the offices of several dentists of Youngstown, O., were burglarized.—June 5, the office of a dentist at Tiffin, O., was robbed of gold scrap.—May 26, six dental offices at Jackson, Tenn., were burglarized, large amounts of stuff being taken in some cases.—May 24, a dentist at El Paso, Tex., was robbed of gold and other materials.—Dr. J. L. Lindsay, Poplar Bluff, Mo., writes as follows to the Digest: "May 27, the Poplar Bluff dentists were relieved of their gold, three of us losing about $180. The 'reliever' was very considerate, as he left the boxes and took the trouble to replace the caps on the bottles which he emptied. It is also evident that he cleaned his shoes before entering, and he did not dynamite the safes. A very gentlemanly sort of fellow—considering. Call again, please, but leave your card."

ILLEGAL PRACTITIONERS.—The manager of a dental parlor at New Haven, Conn., has been arrested for illegal practice, as the state law requires that each office shall be in charge of a registered dentist, which this man is not.—A dentist at Marion, Ind., has been arrested for practicing without a license. He had retired from active work, but happened to make a plate for a patient.—A dentist in Minnesota has been arrested for extracting teeth without a license. He claimed that he did the work merely as a matter of charity, but the court held that that made no difference.—A dentist at Bottineau, N. D., traveling with a fake medical company, has been arrested for practicing dentistry without a license. His work was very poor and some of his victims testified against him.—The license of a dentist at Omaha has been revoked because of unprofessional conduct. It was shown that he "made work" by filling sound teeth.—According to newspaper report the Ohio Board has begun a crusade against the unregistered dentists of the state, and two illegal practitioners at Cincinnati have been arrested and fined. The managers of a "painless dental parlor" at Philadelphia have been arrested on a charge of conspiracy to defraud a woman patient. It is stated that a conspiracy existed between the defendants to defraud the public by untruthful advertising, and also to employ students as dentists. The student who did the work for the woman has been arrested charged with practicing dentistry without a license. In extracting a tooth he injured her jaw so severely that she has never since been well, and heavy damages will be asked.

MARRIED.—Thomas Baxter, Naugautuck, Conn.; Mary English, Waterbury, Conn., June 24.—J. M. Blodgett, Lodi, Cal.; Florence Chase, Lodi, June 3.—S. W. Chipman, Waterbury, Conn.; Isadora Floyd, Waterbury, June 6.—D. W. Campbell, Alpena, Mich., June 12.—A. P. Faass, Utica, N. Y.; Theresa Agnes Reilly, Utica, June 2.—G. H. Griffith, Trenton, N. J.; Edith Corwyn, Catasauqua, Pa., June 4.—A. N. Gaylord, Philadelphia; Hattie Baldwin, Orange, N. J., June 9.—O. S. Groff, Wyandotte, Mich.; Louise Clark, Wyandotte, June 16.—A. L. Gibson, Ukiah, Cal.; Emma Hefty, Oakland, Cal., June 5.—G. H. Hinkson, Media, Pa.; Ada M. Young, Media, June 9.—J. J. Hoffer, Peoria, Ill.; Charlotte Waddell, Grand Rapids, June 3.—G. T. Howard, Newark, O.; May Smith, Newark, June 10.—E. M. Harwood, Los Angeles; Edna Z. Murphy, Los Angeles, June 1.—W. S. Hicks, Princeville, Ill.; Neva Prouty, Princeville, May 27.—C. F. Keiser, Grand Rapids, Mich., Harriet E. Smith, Grand Rapids, June 2.—Marcus King, New York; Bertha Pollack, New York, June 7.—J. L. Pease, Oakland, Cal.; Mabel Gage, Oakland, June 3.—J. R. Ritson, Mt. Morris, Ill.; Charlotte McKingley, Chicago, June 14.—B. E. St. John, Sodus, N. Y.; Jessie C. Logan, Scottsburg, N. Y., June 10.—R. R. Stimpson, Worcester, Mass.; Mary B. Longley, Worcester, June 7.—L. C. Shecut, Orangeburg, S. C.; Blanche L. Dukes, Orangeburg, June 7.—E. F. Stratford, Mansfield, O.; Anna M. Beilstein, Mansfield, May 27.—R. B. Ticknor, Grand Forks, N. D., June 12.—M. L. Wilkerson, Paducah, Ky.; Cora M. Russell, McClure, Ill., May 14.—F. A. Wood, Staunton, Va.; Marion H. Spindle, Richmond, June 16.

FORMALIN AS A DISINFECTANT FOR THE HANDS.—In a paper published in *American Medicine* Dr. Charles P. Noble reports his experience with formalin as a disinfectant for the hands. After having used it for about a month a severe inflammation appeared at the ends of all his fingers, involving the nails. This inflammation was so violent that serum formed under the nails, separating them from the underlying tissue, and it seemed for a time as though all the nails would be exfoliated. Under the influence of rest and elevation of the parts, together with an ointment of ichthyol, the inflammation subsided without suppuration. As a consequence, however, the nails separated on an average about one-third of their length from the distal extremity. The cause of the disturbance described has been traced by Dr. Noble to the use of formalin solution 1:500 as a disinfectant for the hands; and second, its prolonged contact with the finger-ends. The paper concludes with the following judicious statement: This experience is reported not to warn others against the use of formalin solution for hand-disinfection, but to teach the importance of avoiding prolonged contact with even a dilute solution of this agent.

CONTRIBUTION TO THE SURGERY OF CLEFT PALATE.—Ferguson (*Annals of Surgery*). The operative procedure advised in this article is intended to benefit those cases especially in which the palate is oblique and extending into only one nostril. Just before the anesthetic is commenced atropin is given to decrease the secretions of the mouth and pharynx. Chloroform is to be given by the spray method and the patient held in the Rose position, cocain having been applied to all mucous membranes which can be reached. The flap is raised from the septum of the nose and the contiguous portion of the hard palate, and this is pulled down into the mouth. Then from the other side a flap is raised, commencing at an incision along the alveolar margin; this is turned up into the nose, and when the raw surfaces of these two flaps are approximated the mucous membrane of the lesser flap looks toward the nose while that of the first flap faces the cavity of the mouth. These are sewn together, and in one case, which is detailed, a perfect result was obtained. It is said that the nasal twang so common after these operations can be entirely perfected by the patient learning German or French and forgetting English. Then upon relearning English the objectionable sounds fail to reappear.

APPARENT CANCER CURED BY ARSENIC.—L. C. Hull (*Int. Jour. of Surg.*) was called upon to treat a boy twelve years of age, presenting a tumor of the mouth, consisting of a fungus-like mass extending from the cuspid to the last molar of the upper jaw. It had resisted treatment given by previous physicians. It was thought to be either actinomycosis or carcinoma and was removed by a radical operation. The pathological report pronounced it a highly malignant carcinoma. The growth commenced to recur in about one month. The nodules were removed with the Paquelin cautery, but recurred again; then nitric acid, chlorid of zinc and other caustics were tried, but failed to check the progress of the disease. As a last resort a mixture containing 15 grains of arsenious acid to 3 ounces each of alcohol and distilled water was used to paint on the affected area, the mouth being held open and the lips retracted for a few minutes to permit absorption. Except for a

burning sensation lasting a few minutes there was no pain. The nodules at once commenced to diminish in size and in ten days were apparently gone. Occasional applications to any small nodules which made their appearance prevented recurrence, and now after two years the child remains perfectly well. Fowler's solution was also given internally.

INDEX TO ADVERTISEMENTS.